# SCIENTIFIC AMERICAN

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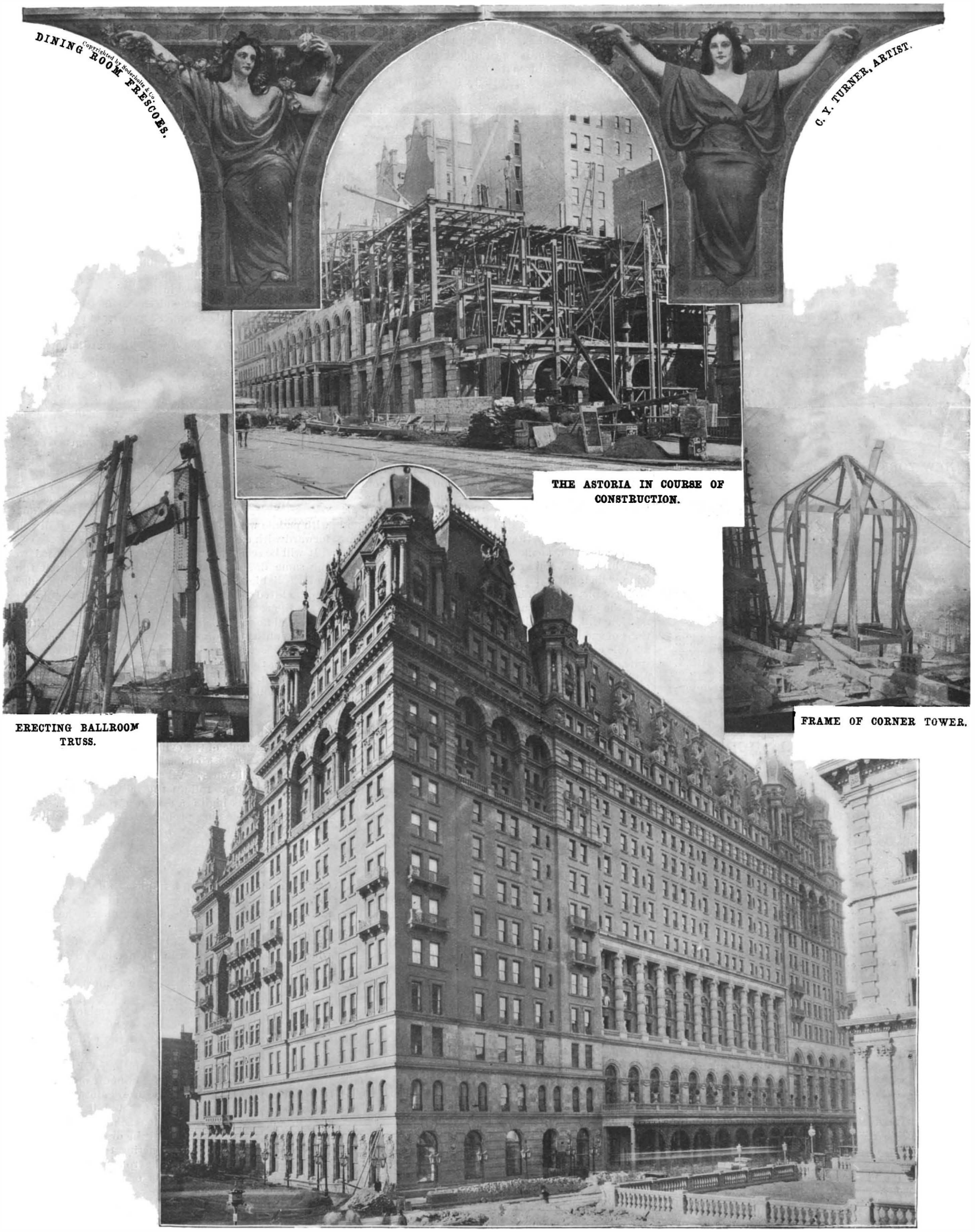
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C. Y. TURNER, ARTIST.
THE ASTORIA IN COURSE OF CONSTRUCTION.
ERECTING BALLROOM TRUSS.
FRAME OF CORNER TOWER.

THE NEW ASTORIA HOTEL, NEW YORK CITY.—[See page 281.]

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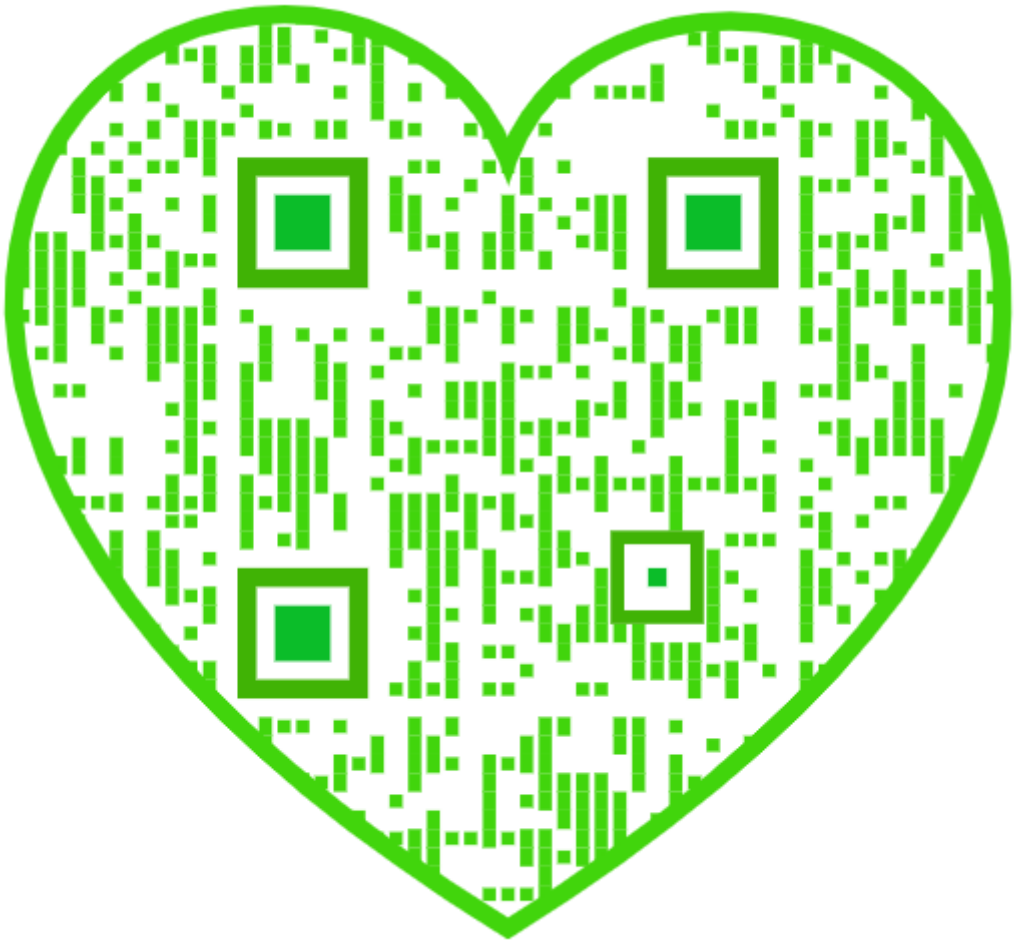

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**Contents.**

(Illustrated articles are marked with an asterisk.)


Arsenical wall paper..... 276
Astoria hotel, the great*..... 273
Authors, prices paid to..... 276
Bevel gear cutting machine*.... 277
Bicycle, the Columbia chainless* 277
Blue, new bismuth..... 278
Boat, the roller..... 274
Books, new..... 284
Cable, Atlantic, curiosities and relics..... 277
Camera lenses (7225)..... 285
Car coupling law, the..... 274
Collodion manufacture..... 278
Concentrator, an improved*..... 276
Cotton crop, our great..... 275
Explosives, multiplication of.... 275
Ferry boat, a Scottish built*..... 279
Field, Cyrus W., collection..... 277
Geographical Society, the N. Y.. 282
Girder, an immense*..... 282
Heavens, the, for November..... 279
Iceland, a cable to..... 283
Ink, black stamping ..... 278
Inventions recently patented.... 284
Leather, waterproofing..... 278
"Magic flowers"*..... 283
Medicines, Argentine law on sale of..... 275
"Music," a ballroom ceiling..... 281
Observatory, Yerkes, dedication of..... 278
Patents and trade marks, new Swedish law..... 275
Patents granted, weekly record of..... 285
Pelican rookery, a great*..... 280
Pullman, George M..... 278
Railway, an inclined plane..... 283
Railway to the Klondike*..... 278
Science notes..... 279
Surgical operation, unusual..... 282
Trusses, great*..... 282
Vaseline testing..... 278
Wagon axle turning*..... 276


TABLE OF CONTENTS OF

## Scientific American Supplement

No. 1139.

**For the Week Ending October 30, 1897.**

Price 10 cents. For sale by all newsdealers.


PAGE

I. ARBORICULTURE.—On the Ascent of Water in Trees.—A paper read before Section K of the British Association at the Liverpool meeting.—By FRANCIS DARWIN, F.R.S..... 18212

II. CHEMISTRY.—Delicacy of Various Reactions for Metals.—By Dr. B. NEUMANN.—An important table giving many reagents.... 18208

III. CIVIL ENGINEERING.—Francois' Air Compressor and Rock Drill.—6 illustrations..... 18210

IV. ELECTRICITY.—Right and Left Handed Armature Winding.—By C. C. HAWKINS.—An important paper for the practical electrician.—17 illustrations..... 18211
Portable Luminous Projector.—A portable searchlight.—3 illustrations..... 18202

V. FISHERIES.—Fishing During a Trip of a Merchantman.—3 illustrations..... 18206

VI. GARDENING.—Art and Nature in Landscape Gardening..... 18214

VII. MEDICINE AND HYGIENE.—Rarefied and Condensed Air.—This paper considers mountain sickness..... 18204

VIII. METEOROLOGY.—Mont Blanc.—Description of Janssen's observatory on the summit and the ascension.—5 illustrations.... 18200
The Zodiacal Light.—By Col. E. E. MARCKWICK.—An important paper..... 18205

IX. MISCELLANEOUS:
Engineering Notes..... 18209
Miscellaneous Notes..... 18209
Selected Formulæ..... 18209

X. PHOTO-ENGRAVING.—The Half-Tone Process Popularly Explained.—By W. GAMBLE.—A popular exposition of the best known processes for doing half-tone work..... 18202

XI. PHOTOGRAPHY.—Solution for Preparing Color Sensitive Plates..... 18207
The Printing-out Platinotype Process..... 18208

XII. PHYSICS.—The Measurement of Small Gaseous Pressures.—By CHARLES F. BRUSH.—Description of a new and improved apparatus.—1 illustration..... 18203
Rarefied and Condensed Air..... 18204

XIII. PSYCHOLOGY.—Dreams..... 18207

XIV. TRAVEL AND EXPLORATION.—Mont Blanc.—A most interesting description of the ascension of Mont Blanc and the observatory erected upon its summit.—5 illustrations..... 18200
The Island of Sakhalin.—A description of Harry de Windt's explorations..... 18201


### THE AUTOMATIC COUPLER LAW TO BE ENFORCED.

Our readers are doubtless aware that there is a law upon the statute books requiring the railroads to equip all their freight cars with automatic couplers, and to equip a sufficient number of them with train brakes to enable the speed to be controlled by the engineer. The time limit for making these changes was set for the first of January, 1898, and the near approach of that day finds the majority of railroads either unwilling or professedly unable to meet the requirements of the law. The statistics in the hands of the Interstate Commission show that some of the railroads have been as diligent in complying with the demands of the law as others have been dilatory. Five roads, the Boston and Albany, the Delaware, Lackawanna and Western, the New York Central and Hudson River, the New York, Ontario and Western and the Lake Shore and Michigan Southern, have equipped the whole of their freight cars with automatic couplers, and from 50 to 75 per cent of their cars are fitted with train brakes. This is an excellent showing and speaks well for the efficiency of these roads. Among the forty-five other roads that have sent in reports to the commission, the percentage of cars equipped with automatic couplers varies from 11 per cent on the Norfolk and Western up to 94·28 per cent on the Chicago and Northwestern. The equipment with train brakes varies from 6 per cent on the Cincinnati, Hamilton and Dayton Railroad to 92½ per cent on the Atchison, Topeka and Santa Fe Road.

Now it appears that a large number of railroads are petitioning the commission for an extension of time for completing their safety equipment. The commission require that all petitions be filed by November 15, and that each road shall state how many cars have been equipped each year since March 2, 1893. In extending the time we understand that the commission will make no general extension, but will consider each case by itself, and will take into consideration the financial standing of the road, and the various causes, such as the "bad times," which may have prevented full compliance with the law.

We sincerely hope that the commission will stand by this policy and maintain a firm attitude in the presence of the influences which are sure to be brought to bear to obtain concessions. It is not unlikely that the very roads that have been most delinquent will be most importunate for further delay. No doubt a strenuous effort will be made by those roads which have not been paying dividends to secure extension of time on this very ground; but that this does not constitute sufficient cause is shown by the case of the Southern Pacific, which is not a dividend-paying property, and yet is able to report that 69 per cent of its cars are equipped with automatic couplers and 96 per cent with train brakes. Another case is that of the Baltimore and Ohio, which has equipped 80 per cent of its cars with both couplers and brakes.

In the presence of such cases as the above the commission will, no doubt, receive very coldly the petitions of such roads as are paying good dividends. A notable case is that of the Chicago and Alton, which in spite of the fact that it has been paying dividends as high as 8 per cent, has equipped only 37·9 per cent of its cars with automatic couplers and 17½ per cent with train brakes. Yet this company is one of the leading petitioners for an extension of time.

Now the question of safety equipment is a question between the profits of the companies and the safety of the employes. One section of the law gives the employe remedy where safety appliances are not in use "by relieving him of the risk which he is held to assume under the common law and would give him the same right to recover as an outsider." If the petitions of the railroads are granted, the commission will take away from the employe this very important remedy. This would scarcely be justifiable, even in the case of such roads as are in financial straits, but in the case of many of the wealthy and profitable roads which are likely to apply for extension of time, it would be a positive shame.

The great body of railroad employes at large will be glad to know that the Interstate Railroad Commission is disposed to take hold of the matter with a firm hand, and it is to be hoped that the welfare of one of the hardest worked body of men in the country will be carefully safeguarded during the hearing, which will take place on the first of December.

### THE ROLLER BOAT PROBLEM.

One would have thought that the failure of the curious roller boat of M. Ernest Bazin would have deterred inventors from further experiment in such an unpromising field, at least for the present. The causes of failure were so radical and inherent in the principles of the design that it is difficult to see what hope there is of any modification in the form of this type of boat serving to render it successful. It will be remembered that the Bazin design consisted of a platform upon which were located the engines, boilers and passenger accommodation, and that this superstructure was carried by six large airtight disk-shaped wheels, arranged in two parallel lines, whose buoyancy served to keep the strange craft afloat.

Each pair of wheels was driven by a 50 horse power engine, and under their combined influence and that of a screw propeller, the ship was rolled, as it were, over the water. The professional standing of M. Bazin, and the fact that a model had shown very promising results in experimental tank tests, restrained the criticism which would ordinarily have been made upon a design which had so many features to render it impracticable, at least upon the high seas.

It is unnecessary to recount the failures of the ship. It was found that the wheels picked up and carried round with them a film or layer of water, whose weight, dragging upon the wheels in the upward half of their revolution, acted like a brake and brought down the speed to a very disappointing figure. It was stated that the inventor sought to overcome the difficulty by the use of some kind of shield or scraper which should free the wheels of water at the water line. This device, however, failed to produce better results. An attempt was then made to increase the speed by an increase of engine power, but the added weight of machinery immersed the wheels so deeply that the increased resistance absorbed the extra engine power, and the speed remained as low as before.

Apart from the question of speed, however, it is questionable whether the Bazin boat would have been comfortable, or even manageable, among the giant rollers of an Atlantic gale or in the wicked cross sea that is often met with in the English Channel.

The failure of this costly venture, however, has not daunted the designer and builders of another roller boat, which is now having its preliminary trials. The designer in this case has decided to dispense with wheels and let the ship do its own rolling. According to published reports the so-called boat is nothing more or less than a huge cylinder 22 feet in diameter and 110 feet long. At about 5 feet from each end the diameter is reduced to 15 feet. Inside the cylinder a number of circular steel tracks are laid completely around the shell, and upon these, by means of flanged wheels, 3 feet in diameter, the engine and boiler platforms travel, the idea being that whatever rotation there may be of the cylinder, the platforms will maintain a nearly level position in the lower part of the shell. Each platform is to carry a boiler and a pair of high speed engines, and the latter will be geared to the platform wheels in the ratio of two to one. The engines are set in motion so as to turn the platform wheels in the direction in which the boat is to travel. If the cylinder were held rigidly in one position the platform would climb the circular track and be carried up the inside of the shell; but as the former is free to move on the water, and is provided with paddle wheel floats, it is expected that it will roll forward with considerable speed across the sea.

It will be seen that the Toronto boat is exposed to the same difficulty as M. Bazin's vessel, in that the water is liable to cling to the surface of the cylinder and be lifted up and carried over, acting as a brake to check the rotation. This effect will be intensified by the radial floats, which will of themselves tend to lift a large quantity of water, that is, supposing that the boat attains any reasonable speed. When the vessel is in motion, the weight of the engine, boilers and platform (which, it will be remembered, are all the time trying to climb the inside wall of the cylinder) will be balanced by the resistance of the water displaced by the cylinder, by the internal friction of the machinery, and by the necessarily large amount of water carried up on the rear side of the cylinder. The last, we think, will be the greatest obstacle to progress when the vessel is in still water. What will happen when the cylinder attempts to roll up the face of an oncoming wave 15 to 25 feet high is a matter of conjecture.

Another troublesome problem to be solved will be that of wind resistance, as the following considerations will show. It is stated that at its launch the cylinder drew 2 feet of water, and that its weight was 70 tons. The total weight is to be about 100 tons, and the draught, when everything is in place, will therefore be, say, about 2 feet 6 inches. This will leave 19 feet 6 inches as the height of the cylinder above the water line. As the length is 110 feet the plane area presented to the force of the wind will be 2,145 square feet. The wind pressure provided for in engineering structures is from 35 to 45 pounds per square foot. If we take the lower figure, we get a total pressure against the vessel in a strong gale of 37½ tons.

As the engines and platform are to weigh apparently only 30 tons, it is evident that however far they may roll up the forward or windward face of the cylinder, they would never prevent the vessel from being rolled bodily to leeward before the force of the gale. Even if the wind pressure be assumed at the low figure of 20 pounds to the square foot, the total pressure against the boat's surface would still be over 20 tons, and if to this be added the internal friction of the machinery, the resistance of the water displaced and the drag of the water lifted up by the floats and adhering to the shell, it is reasonable to suppose that the roller boat will refuse to roll except in calm water or before a favoring wind.

This experiment in marine roller locomotion is as novel in its way as was its predecessor, and fortunately, as in the case of the French boat, it is being carried

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out on a scale that will give a thorough test of its possibilities.

Since the above was written the Knapp boat has had one or two trials which verify the theories we have advanced. In place of the high speed which was expected by the designer, the vessel has, so far, only been able to roll at the rate of six miles an hour in still water.

## OUR GREAT COTTON CROP.

While the few lucky miners who have reached the Klondike are digging for the gold in the frozen ground of their Arctic home, and stories of the wonderful richness of the mines are published to agitate a world of readers, a different kind of a gold mine is being worked in another fairer and warmer part of our country, where the sun shines eternally and the conditions of life are all that one could desire for comfort and pleasure. The great cotton crop of the Southern States is worth several Klondikes; it yields profits to hundreds of thousands of toilers, and enriches our country by many millions of dollars. Our exports of cotton alone amount to more than the output of all the gold mines of the world. We get on the average more than $200,000,000 annually from the cotton we ship abroad, after deducting enough for our own use. The lauded wealth of gold and silver mines sinks into insignificance in comparison.

Early in October the new crop of cotton begins to come to market, and during the pleasant autumn months the white fields of the South are alive with pickers. Simultaneous with the advent of the first large shipment of the new crop, a great industry that gives employment to thousands of men throughout the country awakens into activity. The cotton is picked and baled on the farms scattered throughout the cotton belt, and an army of buyers appear there to solicit trade for their houses. Fully five thousand of these buyers are often in the fields at once, trying to secure trade for their respective houses. The advance couriers receive twenty-five cents per bale commission, and a good buyer will sometimes secure ten thousand or more bales for his house, making for himself the handsome salary of $2,500 for a few months' labor.

The cotton is marked and shipped generally to New Orleans, Galveston, Mobile, Savannah or Charleston, the five leading cotton-receiving cities of the Union. The European tramp steamers visit these cotton ports and load up direct for Europe. Many of these tramps now carry ten and twelve thousand bales of cotton a year, and their size and capacity are increasing year by year. But the great bulk of the crop comes from the Southern ports to New York in the steamers of regular coast lines, which make most of their annual profits in handling the immense cotton crop. In recent years New Orleans has tried to send most of its cotton direct to Europe in regular steamers plying between that city and Liverpool; but New York will control most of the trade for many years yet. Most of the transatlantic lines touch at New York, and they carry the cotton abroad at rates that are hard to outbid.

Besides the army of cotton pickers, the new crop gives employment to thousands of sailors, captains of steamers and trading vessels, merchants and their clerks, truckmen in the city, and lightermen and longshoremen, and many others. It is estimated that, before the cotton reaches the cotton factories, it has given employment to nearly 300,000 people in Europe and this country. In the South a good part of the cotton handling is done by negroes, who, picturesquely attired, load the ships with fleecy bales to the sound of music and song. But when it reaches New York this picturesque scene vanishes. Large, able-bodied longshoremen assemble at the ship's side in response to a whistle, and begin to transfer the cotton from wharf to wharf or from steamer to lighter. These men receive from fifty to seventy-five per cent higher wages than the ordinary freight railway handlers, and they earn from twenty to twenty-five cents an hour.

As most of the cotton received in New York is in transit for Europe or New England, and very little is consumed here, there is of necessity a great deal of transferring from wharf to wharf, and from vessel to vessel. Besides the longshoremen employed in this business, there are the truckmen and the owners and crew of the lighters. The truckmen transfer the bales when the distance is only a matter of a few blocks, and they charge about fifteen cents a bale. The lightermen charge about the same.

The lighters have greatly improved in recent years, and they have labor-saving machinery for facilitating work. They are mostly owned by the big cotton-carrying companies; but some are the sole possessions of their captains or small lighter companies who operate two or three. The ordinary lighter carries from 1,000 to 1,500 bales at a time. The lighters can draw up alongside of a Southern steamer, and, by means of machinery, take the heavy bales from her hold and transfer them to their decks without much trouble. The crew of these lighters receive rather less pay than the regular longshoremen, but their labor is less onerous and wearying. The derricks do most of the lifting, while the men merely guide the swinging bales as they shoot up in the air and land on the deck of the lighter.

Each compressed bale of cotton weighs about 500 pounds, and uncompressed nearly a third less. Sea Island cotton is generally received here uncompressed, for there is a prevailing notion abroad that it is injured by the process. Nevertheless, greater care is exercised in handling the Sea Island than the ordinary varieties. There has been considerable discussion in late years about improving our methods of baling. Before the bales reach their final destination there is a large percentage of loss to be deducted through insufficient covering of the cotton, and this has prejudiced foreign dealers against handling American cotton except when forced to.

Cotton picking is done almost entirely by hand. Large sums of money have been invested in cotton picking machines, and several have been put in the fields to do the work of negro laborers; but so far the problem of reducing this work to machinery has not yet been solved. The expense of picking is the heaviest item in handling the crop. It costs between fifty and sixty million dollars to harvest the crop annually. A negro picker in slave days averaged 100 pounds of cotton per day; but this average is nearly doubled by the modern employes, who receive from 35 cents to 50 cents per 100 pounds in various States of the South.

When picked, the cotton is carted to the gin house, where it is weighed and piled away. The ginning process is nearly the same as that introduced by old Eli Whitney years ago, and there is no apparent need for any improvement. The fiber passes through a series of circular saws or rollers which tear the seed from the fiber and blow them out into two separate compartments. Formerly all this cotton seed was practically wasted; but now it adds about $50,000,000 annually to the resources of the South. To every bale of 500 pounds there are generally about 800 pounds of seed, and a ton of this seed yields about thirty-five gallons of oil, valued at forty to fifty cents per gallon. This part of the industry has sprung into existence only in the past ten years; but it is already an enormous business. In 1889 the export of cotton seed oil amounted to 6,250,000 gallons, and in the next year it reached 14,324,000 gallons. In 1895 over 1,200,000 tons of cotton seed were crushed and about 42,000,000 gallons of oil were obtained. Besides furnishing oil, the cotton seed, after it has been crushed, supplies the cattle with good food in the form of meal and cake, which is claimed to be only a little less nourishing than corn.

The cotton belt of the South has been greatly extended since slave days. Then it was considered to be only a narrow belt through Georgia, the Carolinas and Virginia; but it now measures about 600,000 square miles. All of it is not by any means cultivated with cotton. Probably not more than 20,000,000 acres are cultivated with cotton in any one year, and some years it has run less than half this number of acres. The average yield of this immense territory is between 6,000,000 and 9,000,000 bales. Texas leads all the other States by nearly one-half, with Georgia and Mississippi following in order. With an average crop of 8,000,000 bales, we lead all other countries by far in cotton growing. India is second, with about 3,000,000 to 4,000,000 bales, and China and Egypt come next in order with less than 2,000,000 bales each. The cotton area in these other countries is being extended, however, and while the South will undoubtedly always control the markets of the world, she will suffer more or less from foreign competition. We produce the best cotton in the world, and in no parts of the globe can our famous Sea Island cotton be duplicated. This variety, Gossypium Barbadense, grows on the islands off the coast of South Carolina and Georgia, and produces a fiber about one inch longer than that of any other variety grown in this or any other country. The Sea Island cotton is as fine and glossy as silk, and the English spinners take nearly all that we can raise of this superior grade.

There have been many agencies at work to improve the cotton crop as well as to utilize the by-products; but so far the only real advance has been made through the slow process of superior cultivation and the improvement of plants by careful selection. Recently the newspapers gave currency to a story of a marvelous cotton plant introduced from Africa, which promised to revolutionize the cotton industry of the world in a year or two. This new cotton plant was described as towering to the height of twenty feet, and producing a great mass of downy balls that would increase the acreage enormously. But R. J. Redding, director of the Georgia Experiment Station, discounts the wonderful claims of the new variety, and adds: "The claim that the variety of cotton belongs to a different genus cannot for a moment be allowed. It is not even of a new species, but simply a variety of Gosspyium herbaceum, and very probably of local (domestic) origin."

Nevertheless, the cotton plant has been greatly improved in the last half century through cultivation and selection. Fifty years ago the old "peeler" variety of cotton was used entirely by the Southern planters. This was a long jointed, straggling variety, with comparatively few bolls to the stalk. The comparison between it and a specimen of the present "peerless" variety is vivid. The latter is short, compact in form, and loaded down with bolls. The first step in improving the upland short staple cotton through careful selection and cultivation was followed by an improvement in the length and fineness of staple. This was accomplished by hybridizing it with the long staple or Sea Island cotton. The result of these two improvements, carried on through many years of careful work and study, is that the modern "W. A. Cook" variety shows such an improvement over the old "Dixon," popular forty years ago, that one would hardly recognize them as belonging to the same class of plants.

## NEW ARGENTINE LAW IN REGARD TO THE SALE OF MEDICINES.

The Congress of the Argentine Republic is expected to pass a law creating a national board of health (or Department of Public Health, as it is called officially). The law will become effective in a short time. This board of health will have complete control as to what medicines or compounds shall be allowed upon the Argentine market, as will appear from the following two articles of the law:

Article 36.—It shall be lawful to sell or to expose for sale in any pharmacy or apothecary's shop or store such specialties or compounds only whose component parts are clearly specified upon a visible part of the package thereof, setting forth also the doses of the active substances contained therein.

Article 37.—The Department of Public Health will authorize the sale of the medicines referred to in Article 36, when the required conditions have been fulfilled, without which authorization such goods cannot be offered for sale.

Failure to comply with the requirements of these two articles will be punished by a fine of from $100 to $200.

It will therefore become necessary for American manufacturers exporting medicinal compounds and specifics to the Argentine Republic to obtain the required permit from the Department of Public Health and to state the composition of the medicine on each package. Full information concerning the further requirements for securing the above permit will be supplied upon application to the editors of this paper.

## CHANGES IN SWEDISH PATENT AND TRADE MARK LAWS.

Under the present Swedish patent law, the publication of a printed copy of a foreign patent becomes a bar to the allowance of a Swedish application only when said application is filed more than 180 days after the date of publication. An amendment which will take effect January 1, 1898, provides that an invention will not be considered patentable if the application for a Swedish patent is filed after the issue of any printed publication (including a printed patent copy) in any country. However, if an invention has been exhibited at an international exposition, any publication made simultaneously with the exhibiting of it, or thereafter, will form no bar to the allowance of an application for patent, provided said application is filed within 180 days after the invention has been exhibited.

According to an amendment which took effect on October 1, 1897, trade marks may now be registered even when they consist of fancy designations, that is, words coined for the purpose of designating certain goods, provided such words do not indicate the origin, nature, intended use, amount or price of the goods. Under the old law, words could be registered as trade marks only when printed in a distinctive style.

## MULTIPLICATION OF EXPLOSIVES.

The ingenuity that has been exhibited of late years in the discovery and application of explosives for mining purposes has really been remarkable, and not less so has been the growth of the trade in explosives during the period of twenty years since the English act of 1875 came into operation, says The Trade Journals Review. Not only has the number of factories more than doubled, but the number of persons employed in them is now over 10,000, which shows an increase of nearly 3,000 even during the last ten years. This increase follows naturally on the increase in the number of nitroglycerine compounds in the market and the introduction of smokeless powders. Four new factories have been licensed during the year 1895 and 113 since the act came into operation, or more than double the number of factories existing at the passing of the act. The net increase is 79 factories, or an average of 3·95 annually. While the number of factories in which gunpowder and nitrate mixtures may be made has remained stationary during the twenty years, the number in which nitroglycerine compounds may be made has risen from one to nine, and whereas dynamite was the only nitroglycerine compound produced in 1876, there are now twelve such compounds licensed. The guncotton nitro-compounds, which include nearly all the smokeless powders, were nine in 1876, and are now twenty-nine. Similarly, the fulminate of mercury factories have increased from two to six.

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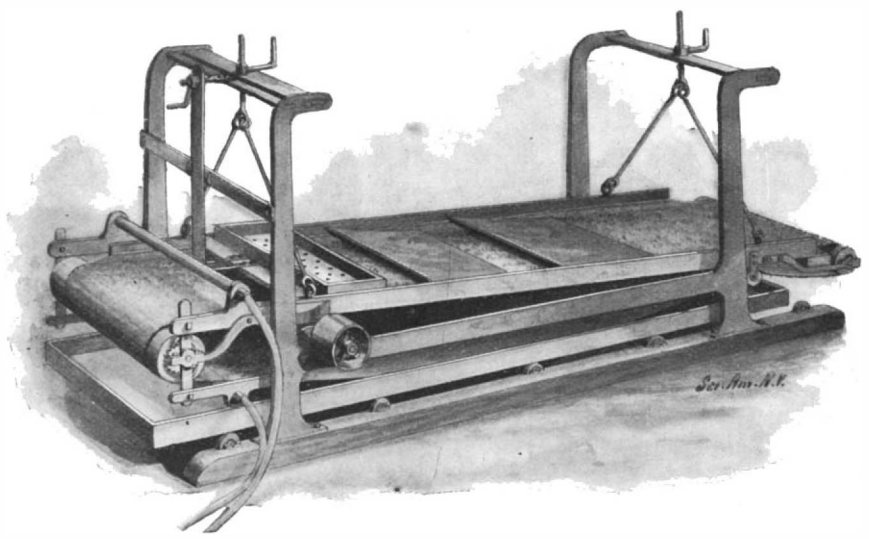
### AN IMPROVED CONCENTRATOR.

We present herewith a view made from a photograph of a practical working concentrator, to facilitate the separation of the valuable particles of the precious metals from the lighter materials and gangue. The improvement was recently patented by William M. Moore, of Empire, Col., and was described in the SCIENTIFIC AMERICAN of September 11, but with the table suspended by four links, two at each end, instead of by a bail and a single link at each end. The latter construction, as shown in the accompanying illustration, has the advantage of enabling the operator not only to more easily adjust the table to the desired inclination, but obviates the difficulty, heretofore a considerable one, of the tilting of the table, whereby one corner would be lower than another, thus causing an uneven flow over the table. It will be understood that regulated intermittent impulses are given to the table, as a belt travels over it in the direction of its higher end, this belt consisting of carpet having a heavy pile, and its lower run passing through and depositing the concentrates in a wash box below, there being also on top of the belt aprons made of carpeting to prevent the material from getting under the belt. The material to be treated is fed through a trough with perforated bottom at the upper end of the table, where a perforated pipe discharges a spray which washes the lighter materials down the belt, to be dumped over on the ground. The wash box is constantly supplied with fresh water to insure a proper cleaning of the belt, and is readily removable as desired, as the concentrates accumulate.

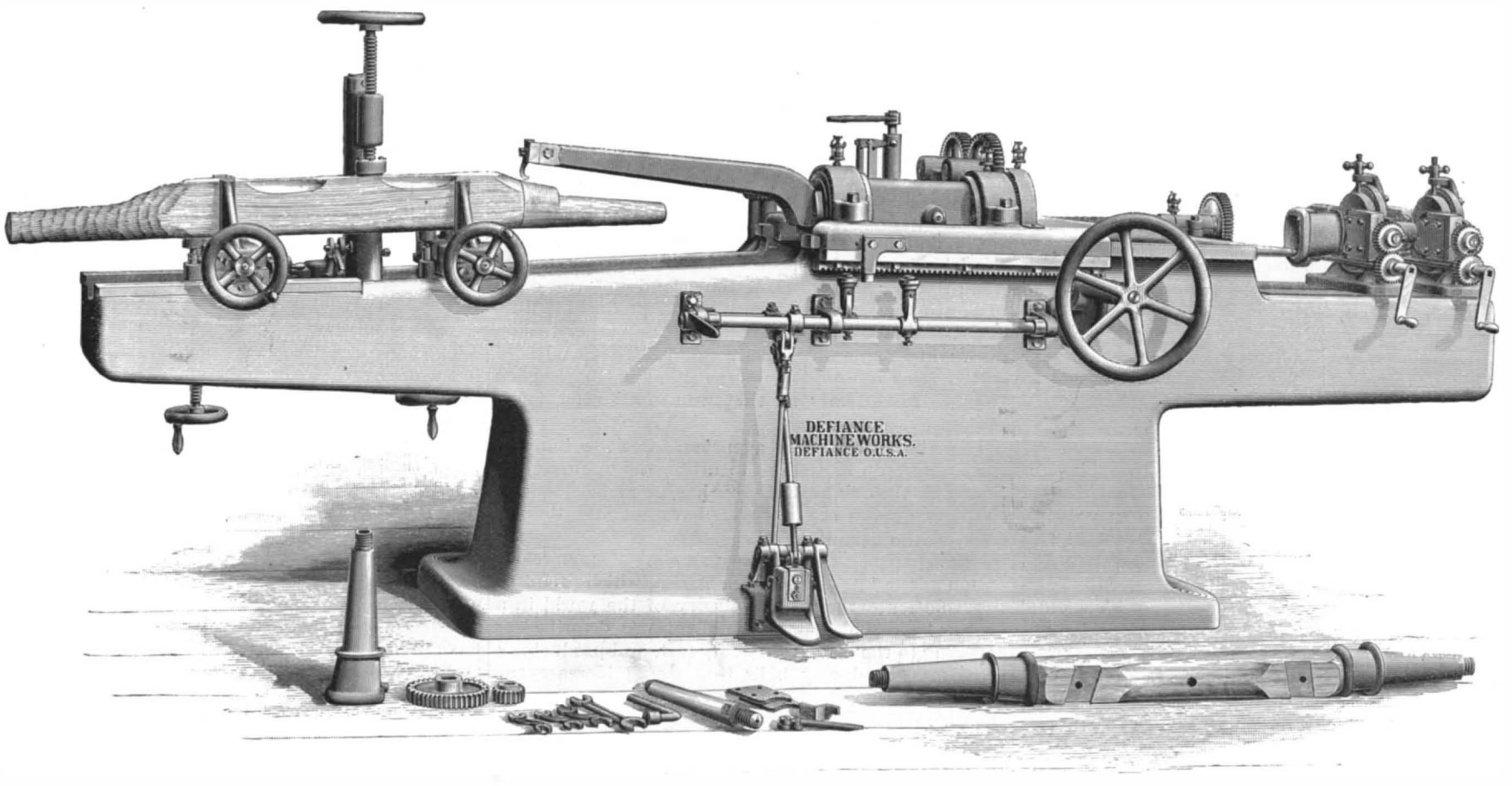


MOORE'S CONCENTRATOR FOR PLACER MINING OR STAMP MILLS.

### A MACHINE TO TURN THE ENDS OF WAGON AXLES.

The accompanying illustration represents a highly efficient machine, designed for the use of wagon and truck builders, to turn the ends of wooden axles to the proper size and shape to fit the interior of either large or small cast iron or steel skeins. To do this work by hand has heretofore required the services of skilled workmen, exercising especial care, in order to obtain accurate fitting and insure proper dish and gather, while, with this machine, unskilled labor may be employed and the work done at the rate of 200 axles in ten hours. The machine is manufactured by the Defiance Machine Works, of Defiance, Ohio and has a large and heavy frame or bed, to do away with all tendency to twist or spring and insure exact movement of the working parts. The cutter bar, of heavy forged steel, has at its rear end a friction roller which traverses the interior of the skein to be fitted, as shown at the right in the illustration, the opposite end of the bar being provided with an adjustable cutter. The cutter bar oscillates upon a heavy steel spindle turning through its center, and which connects it with a circular sleeve which revolves in large bearings mounted on a sliding carriage, the latter being fitted to the frame in heavy ways provided with gibs, and having a horizontal adjustment by hand wheel. The cutter bar is rotated by cut gearing and a double friction clutch, so arranged that a high speed is obtained when cutting the round portion of the axle, the speed being automatically reduced when the cut reaches the oblong form near the mouth of the skein. When the end of the cut is reached the machine stops automatically, and by the opening of a split nut on the screw feed is self-released for the return of the carriage for the next cut. The axle to be operated upon is held in the machine by self-centering jaws set by right and left hand screws, and a swinging screw clamp which can be moved out of the way when putting in or taking out the axle, a novel device being used for securing the proper amount of gather without the use of a rule or any guesswork on the part of the operator. The skein at the other end of the machine is self-centered by adjustable jaws operated by cut gear and right and left hand screws, arranged to hold accurately skeins of any kind or size.

When the skein and axle are placed in the machine, as shown in the engraving, the carriage carrying the cutter bar is moved backward, the friction roller attached to the rear end of the bar moving rearward in the skein. By pressure on the pedal the friction clutch is then engaged, when the cutter bar revolves and feeds into the cut, the friction roller following the inside shape of the skein, which governs the path of the cutter and turns the end of the axle to an exact duplicate of any skein placed in the machine. The change of speed of the cutter in passing from the round to the oblong portion of the cut, the stopping of the machine and the opening of the feed nut, are all automatic, requiring no attention on the part of the operator. The net weight of this machine is 6,000 pounds.




AN AUTOMATIC WAGON AXLE SKEIN SETTING AND FITTING MACHINE.

### Prices Paid to Modern Authors.

Rudyard Kipling commands the highest price of any living author, according to the Pall Mall Gazette, which says that it paid $750 for each of his "Barrack Room Ballads," and that "The Seven Seas" brought him $11,000. He has received 50 cents a word for a 10,000 word story. Anthony Hope charges $450 for a magazine story, reserving the copyright. Mr. Gladstone's price for a review is $1,000. Conan Doyle received $35,000 for "Rodney Stone," Mrs. Humphry Ward $40,000 for "Robert Elsmere," $80,000 each for "David Grieve" and "Marcella," $75,000 for "Sir George Tressady," and $15,000 for "Bessie Costrell." Ian Maclaren has made $35,000 out of "The Bonnie Briar Bush" and "Auld Lang Syne." Rider Haggard still asks from $75 to $100 a column of 1,500 words and will not write for less than $10,000.

The highest price ever paid for a novel is $200,000, which, the Pall Mall Gazette says, was handed over to Alphonse Daudet for his "Sapho." Zola's first fourteen books netted him $220,000, and in twenty years he has made at least $375,000. Ruskin's sixty-four books bring him in $20,000 a year. Swinburne, who writes very little, makes $5,000 a year by his poems. Browning, in his later years, drew $10,000 a year from the sale of his works, and Tennyson is said to have received $60,000 a year from the Macmillans during the last years of his life. Mr. Moody is believed to have beaten all others, as more than $1,250,000 has been paid in royalties for his hymns.

### Arsenical Wall Paper.

The fact that pigments containing arsenic are dangerous to the health is too widely known to require special mention. It has been especially found that arsenical wall paper, hung in damp rooms, has frequently caused chronic cases of poisoning in the occupants. There are two contrasting opinions as to the way this arsenic poisoning comes about. Some think that the dust which becomes separated from the paper through wiping or concussion, as well as expansion and contraction, caused by changes in the temperature, is scattered about and enters the lungs of the occupants, thus giving rise to poisoning. According to the views of others, the health of the occupants of rooms provided with such arsenical wall paper is injured by arseniureted hydrogen gas, assuming that this is formed through the influence upon the arsenical substance of the paper of organisms which appear when the organic binding agents, such as paste, etc., used for attaching the paper, become mouldy.

To solve this question extensive researches have been made for the first time by Emmerling in the laboratory of the Berlin University, the results of which seem to confirm the correctness of the first-mentioned opinion. It was shown that cultures of various bacteriæ, as well as several mould fungi, were not able to develop any trace of arseniureted hydrogen from arsenical substrates. Nor did this gas form when paper with paste and Schweinfurth's green, which is known to be highly arsenical, was exposed to moisture and became covered with an abundance of large mould fungi. It may be assumed, therefore, that the first-mentioned opinion, which assigns the cause of the appearance of cases of chronic poisoning to the pulverization of the coating of the wall paper, is the correct one, unless still other conditions enter in the matter, which may have a bearing on the question.

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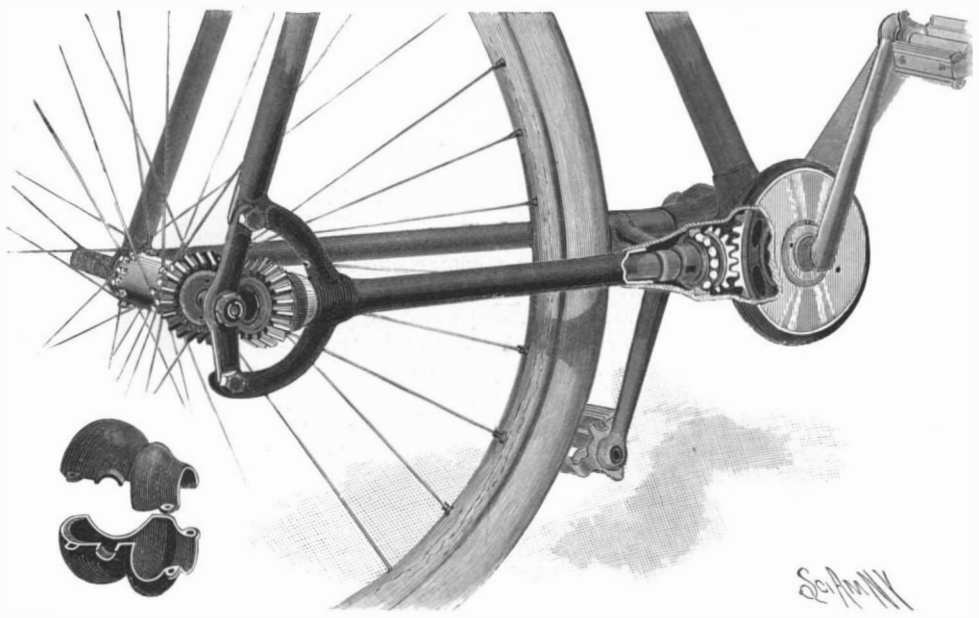
### THE COLUMBIA CHAINLESS BICYCLE.

It has been known for many months to those wheelmen who take an interest in the development of the bicycle that the oldest bicycle manufacturing firm in the United States was intending to commit itself to the chainless type of bicycle as its standard model for the year 1898. In the accompanying cuts we are enabled to present to our readers the mechanical details of the driving gear of the Columbia chainless bicycle and of the ingenious machine which has been specially designed for cutting the epicycloidal teeth of the bevel gears.

The intense interest of the riding public in the question of a chainless bicycle and the unquestioned trouble and expense that several leading manufacturers, both in Europe and America, have gone to in the endeavor to build a satisfactory wheel of this type presuppose that there is more or less dissatisfaction with the chain-driven wheel. This is due to the difficulty of keeping the chain clean and to the rapid wear (known as "stretching") which takes place on the chain when it is put to continuous hard work. The stretching results in an alteration of the pitch line and a consequent increase of friction in running. Moreover, there is a measure of objection to the lubricated chain, due to the soiling of the clothes, and, in the case of lady riders, the catching and tearing of the costume.

On the other hand, the chainless wheel is free from these objections. The driving gear is inclosed and is as fully protected from the entrance of foreign substances as the bearings themselves. Hence both the gear and the rider are protected, the one from grit and mud, the other from oil, graphite or other more or less greasy lubricants. Moreover, on the score of appearance, the chainless wheel would naturally, on account of its compact parts, have everything in its favor. The only point upon which both the manufacturer and the public were doubtful was the possibility, first, of cutting bevel gears that would run with the smoothness and silence absolutely necessary for a bicycle; and secondly, whether these gears could be mounted in so light a construction as the frame of a bicycle with sufficient rigidity to insure their being kept in perfect alignment under the strain of daily service.

In our last issue we gave the detailed construction of a chainless machine in which the distortion of the machine was provided for by the interposition of a double jointed shaft for transmitting the motion from one pair of gears to the other. The chainless machine which is herewith shown relies upon the great strength of the material and the special design and rigidity of the frame for keeping the gears in alignment. Smoothness of running is secured by the great care and special tools used in cutting the gears. The lines of the Columbia chainless are similar to those of the latest Columbias of this year. They have a head of medium height and a drop crank hanger. The most apparent change is in the lower right rear fork and stay, which do not intersect at the hub, but are connected by a semi circular arm, which serves to support the lower right stay, in which is carried the countershaft which transfers the motion from the crank axle driving gear to the gear on the rear hub. The end of the rear axle is held in a swinging arm which is bolted to the ends of the semicircular bridge aforementioned. The driving wheel is attached to the front axle in the position occupied by the sprocket in the chain-driven wheel, and this wheel and the adjacent gear wheel on the countershaft are completely inclosed in the crank hanger, which has its right rear fork lug sufficiently enlarged to take the countershaft gear. The tube of the rear right fork is brazed into this lug and into the semicircular bridge before mentioned, and this arrangement, combined with the bracing effect of the swinging arm, presents an exceptionally rigid support for the countershaft and is well calculated to hold the crank axle, the countershaft and the rear hub in their proper relative alignment. The countershaft turns in two sets of ball bearings, one at each end, which are located immediately to the rear of each bevel gear. The bearings of the crank hanger and the rear hub are of the usual Columbia type.



THE DRIVING GEAR OF THE COLUMBIA CHAINLESS BICYCLE.

The confidence of the Pope Manufacturing Company in the possibilities of the chainless wheel was based largely upon the excellent performance of the old League chainless, which made its appearance in Hartford some four years ago. The failure of this wheel as a commercial venture was not due to the driving mechanism, but to the secondary features of weight, great width of tread and ungainly appearance. The smooth running of the gear and its endurance were remarkable, and a local rider is credited with having made on one of them sixty consecutive centuries in sixty consecutive days. The Pope Manufacturing Company secured possession of the patents.

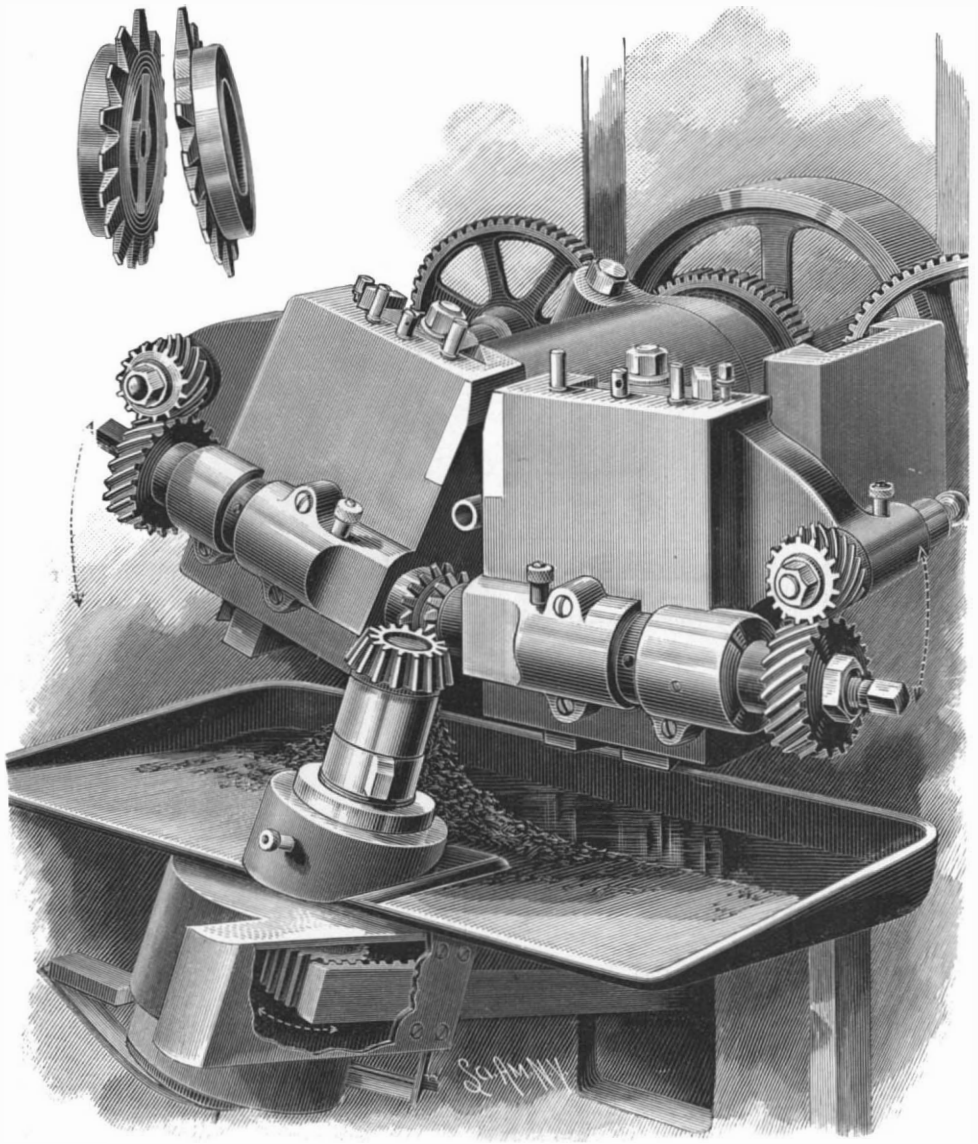
They have built many successive models of which the one now put upon the market has given complete satisfaction. We have spoken of the necessity of rigid framing and perfect alignment, but of even greater importance is the necessity of cutting bevel gears that should be mechanically accurate if they are to work with the perfect silence and smoothness that characterize a first-class bicycle. The difficulty in cutting bevel gears in a machine arises from the fact that the teeth for their full depth have to be evenly tapered throughout their length. The old machine-cut teeth were tapered at the point but not at the root, and it was only after a certain amount of wear that really good results were obtained in a new set of bevel gears.

The Pope Manufacturing Company have had designed an ingenious machine with various compound motions by which it is possible to cut gears whose teeth shall have at every point a mathematically exact taper. So perfect is the result that when two such gears are run in contact, the friction is practically as small as after several months of wear. The gear cutter is also capable of giving the proper increase in the lateral diameter of the teeth from the face toward the axis and producing the epicycloidal curve which enables the surfaces to meet and separate as the gear rotates with a rolling instead of a sliding contact.

The accompanying illustration shows the gear cutting machine. The two cutters rotate in two rocking heads, which are set at the proper angle corresponding to the desired taper of the teeth, and the gear is fastened to the inclined arbor of the milling machine. The arbor, with the attached gear, has a slight oscillating movement, which serves in combination with the action of the revolving cutters to give the proper cycloidal curve to the teeth. This motion is secured by means of a rack and pinion located beneath the table. The two rocking heads which hold the cutters are rigidly attached to a common shaft, the center of which coincides with the apex of the gear cone. It is the combination of these two motions, namely, the rocking of the gear cutters and the oscillation of the gear, that produces the mathematically perfect cycloidal teeth of these bevel gears. In order to cover the whole length of the tooth, the cutters are given a vertical travel of the required length. The cutting face of the cutters is given a fifteen degree slope.

The stock is cut out of the gear blanks on one of the old type of gear cutters, and only the shaping and finishing are done on the new machine.

The machines are completely automatic. After the gear has been inserted the cutting of the teeth goes on automatically until the whole set has been completed.



MACHINE FOR CUTTING THE BEVEL GEARS.

### The Cyrus W. Field Collection.

The National Museum at Washington has just received a collection which possesses extreme interest to electrical people, says The Electrical World. It comprises the private papers of Mr. Cyrus W. Field relative to the laying of the Atlantic cable, cable dispatches first sent, objects with which he worked out the idea of laying the cable, and many other things of interest pertaining to the project. The correspondence and autograph copies of telegrams sent by Mr. Field to the President of the United States and other prominent persons are included. The globe, constructed by a London manufacturer, on which Mr. Field traced the course for the cable to be laid from Newfoundland to Ireland, forms an interesting object of the collection. It is about a foot and a half in diameter, on a stand, with a magnetic compass beneath, and shows many signs of hard usage. The journal kept by Mr. Field, and notes of deep sea soundings set down by him and officers of the Great Eastern, by which the cable was laid, are part of the collection. Mr. Field's private library, with all the literature relating to the work of laying the cable, forms another part. There are also copies of medals presented to him by Congress and the French government, engrossed resolutions passed by bodies in this country and in Europe, a cane from the wood of the Great Eastern, etc. Among the relics are cases containing sections of the first Atlantic cable. The collection was the property of Mrs. Isabella Field Judson, of Dobbs Ferry, N. Y., who is a daughter of Mr. Field. The donation was secured by Professor Watkins from Mrs. Judson.

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### Notes and Recipes.

Waterproofing Leather.—A process for waterproofing leather has been patented in Germany. Dissolve beeswax in benzine to saturation and heat the solution in a water bath, then add about one-tenth of spermaceti in a melted state. For use warm the mass again in a water bath and apply warm with a brush or a pencil to the dry leather, which has likewise been suitably warmed.

New Mode of Manufacturing Collodion.—According to a patented process by Schlumberger, it consists in dissolving the guncotton in ethyl alcohol or methyl alcohol, to which a small quantity of one of the following substances is added: Levulose acetic acid, oxalic acid, citric acid, tartaric acid, lactic acid, hydrochloric acid, or their alkali salts or earth alkali salts or zinc salts soluble in alcohol, aldehydes of acetic acid and benzoic acid or their acetates, ether of alcohol, with the above named acids; picric acid and salicylic acid, nitro-benzine, chinoline, pyridine, urea, glycocol.

Fast Black Stamping Ink.—According to the Pharm. Zentrh. a fast black stamping color for linen, cotton and woolen fabrics is prepared as follows: Dissolve five parts of nitrate of silver in ten parts of spirits of salammoniac, and prepare another solution of five parts gum and seven parts soda in twelve parts water. Mix both solutions and heat carefully in a porcelain dish on the water bath until the liquid has become black. This will render the stamped signs visible at once, but the fastness will ensue in the fiber only during the drying. This argentic stamping color is absolutely fast to washing and likewise to light.

New Bismuth Blue.—If a chloride of bismuth solution is mixed with ferrocyanide of potassium, a yellow precipitate separates out, as reported by Fr. Faktor, in the Ph. Post, which receives a light green color on shaking or boiling. After the addition of a few drops of nitric acid or potassium chlorate, the color changes into dark green and later into dark blue. With this, vapors escape which betray hydrocyanic acid by the odor. In order to be certain that the bismuth blue is a product of the air oxidation, the color was produced in the absence of oxygen. The result was a green precipitate, which only changed its color when it came into contact with the air, taking on the blue color first on the surface and later more and more in the interior. As an oxidizing medium, chlorate potassium or nitric acid has been found valuable. The blue precipitate produced in this manner was filtered, washed with hydrochloric acid and dried at 100° C. The dried precipitate forms a powder which assumes a darker color on heating. Bismuth blue is insoluble in cold or boiling water, likewise in cold and diluted hydrochloric acid; in strong hydrochloric acid it dissolves with a green color. In cold sulphuric acid it is insoluble, but is soluble in the concentrated acid. Nitric acid does not dissolve it. Diluted potash or soda lye changes the blue color into green. Ammonia changes the color into green-blue, if boiled long. In a cold soda solution the color does not change. When boiled, bismuth blue passes into solution.—N. Erf. u. Erf.

Testing Vaseline.—According to the Pharm. Zeitung, proceed as follows: 2 grammes vaseline dissolved in 5 grammes chloroform and agitated diligently with 10 c. cm. water are not changed by a drop of phenolphtalein solution, and show a strong red color upon the addition of a drop of one-tenth normal potash lye; whereby, on the one hand, the absence of the alkali is proved, and on the other hand, absolute freedom from acid; 10 grammes vaseline are heated with 10 grammes water in a water bath one-quarter hour. After cooling, the decanted water, which reacts entirely neutral and gives no reaction on sulphuric acid with chloride of barium, is evaporated on a watch glass, whereupon only an imponderable residuum remains. Vaseline is made brown by sulphuric acid (98 per cent) in the water bath. If a weaker acid (73 per cent) is used, no influence is shown and the acid is only changed if the preparation is imperfectly purified (technical vaseline). The best way to proceed is as follows: 10 grammes vaseline are melted in a water bath and 50 drops of a 73 per cent sulphuric acid added. Now heat one-quarter hour in the water bath while stirring. In the case of pure vaseline the sulphuric acid is hardly changed. No dark ring forms where the two zones touch when the acid is allowed to settle, nor is the acid dyed brown. Five grammes vaseline are heated with 5 grammes carbonate of soda and 25 grammes water in the water bath one-half hour, while stirring. After cooling, the aqueous solution is decanted and supersaturated with diluted hydrochloric acid. The liquid remains clear, if neither resins nor fatty acids were present.

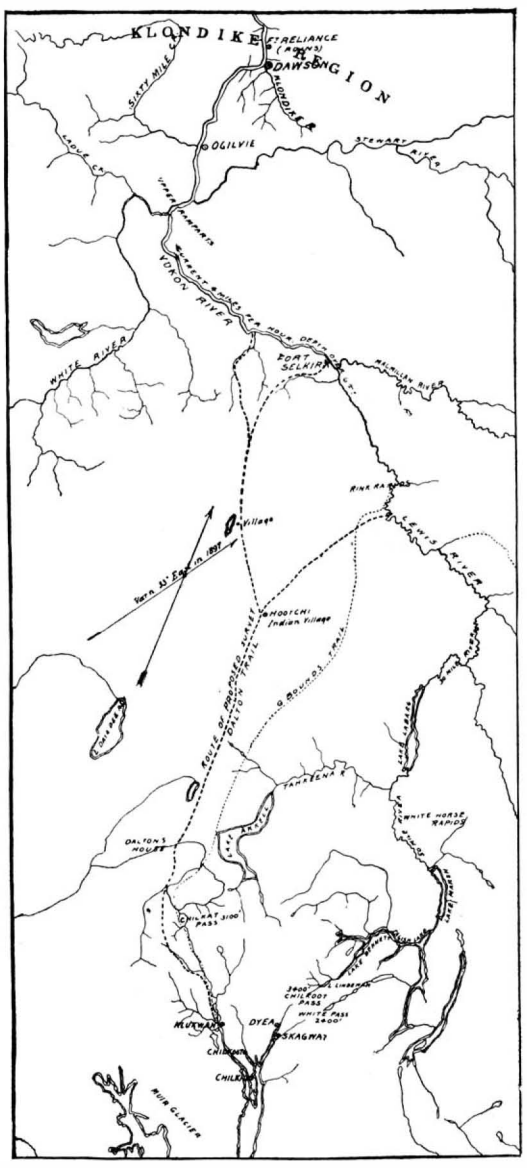
### Dedication of the Yerkes Observatory.

The Yerkes Observatory at Williams Bay, Wis., was dedicated on October 21, when Mr. Yerkes gave to President W. R. Harper the keys of the building which contained the great telescope. The ceremonies covered two hours. Mr. Yerkes himself presented the gift, which is valued at $350,000. Prof. James E. Keeler made the speech which marked the opening of the dedication exercises. Seven hundred persons were present. Prof. Barnard announced, on October 20, that he had already discovered a third companion star to Vega with the great instrument. He found it because the Yerkes telescope was more searching than any other in the world.

### SURVEYING FOR A RAILROAD TO THE YUKON VALLEY.

The most formidable and best equipped expedition, both in numbers and material, having for its object the exploration and development of the country at the headwaters of the Yukon River, sailed from Puget Sound on the 15th of the present month (October). The company originated in Boston and included men from San Francisco and Seattle, and is backed by a capital of $200,000, all paid. The expedition embarked in a large steamer, chartered for the occasion, and is composed of two divisions, one, comprising 45 men, including prospectors and others, for development and exploration; and another, composed of engineers and subordinates, for reconnoitering and preliminary survey of a railroad route from the mouth of Chilkat Inlet to Fort Selkirk, on the Yukon.

Fort Selkirk is the objective point of both divisions, where the headquarters will be permanently established. The surveying party will locate, as a starting point, at Klukwan, an Indian village of 300 inhabitants, at the head of Chilkat Inlet and mouth of Chilkat River. The equipment of the expedition is most complete, and includes 150 head of cattle, 200 horses, feed for stock and 200 tons of stores, and every known appliance for protection against the extreme cold of the region has been provided. The programme of the prospecting party after disembarking at Chilkat Inlet, where deep water navigation exists, is to follow the general route of the Dalton trail, as direct as possible, to Fort Selkirk, which will be reached, if the plans do not miscarry, early in January. Here headquarters will be established, and in the early spring prospecting parties will be sent out for a thorough exploration of the country. It is believed that gold will be found all over the Yukon Valley and in the beds of the various streams emptying into that river.




PROPOSED RAILWAY TO THE KLONDIKE.

Ten skilled prospectors from California accompany the party and will head the divisions into which it will be divided in the early spring. Each man will be provided with all the implements, stores, etc., necessary for rapid and effective work, and the whole will be under the command of Capt. J. E. Smith, of San Francisco, a successful and experienced miner and prospector. The rank and file are men who are financially interested in its success and have each enlisted for a term of two years The entire plan is somewhat on the cooperative principle, each one sharing in the good fortune or otherwise of the undertaking in certain proportion. The distance from Chilkat Inlet to Fort Selkirk is estimated at 300 miles. The country has been traversed by Indians and white hunters for years, and from the best information available it is not thought that the impediments that are likely to be met will prove insurmountable.

The party making the reconnaissance for a practicable railway route will make its western headquarters at the head of Chilkat Inlet. It consists of Col. W. C. Alberger, of San Francisco, who ranks high as an engineer and in the military profession, as consulting engineer; Walter J. Fogelstrom, who achieved distinction in Peru and as an Arctic explorer, as chief engineer; and A. W. Blake and A. B. Shearer as assistants. In addition twenty chain and transit men besides workers constitute the party. A force of natives will also be engaged as packers. It is the purpose of the engineers to survey all the known passes affording entrance into the Yukon Valley. The general features of the Chilkat, Chilkoot, White and other less known passes are fairly well understood, but accurate detail is wanting.

It is the confident expectation of the party to discover a route into the Yukon Valley in every respect easier and more direct with less elevation than those now known. White explorers assert confidently that to the north of Chilkat Pass (and the Indians say the same) the range of mountains that skirt the whole western border of Alaska, from Mount St. Elias southward, sinks to a very low elevation, estimated at 2,000 feet, somewhere about this locality.

An explorer who traveled through this part of the country in the last few months mapped out a route crossing two low ranges which, in his opinion, offered a perfectly feasible route for a railroad. For a hundred miles along the Dalton trail the land is heavily timbered, and spruce with trunks three feet in diameter are numerous. The grade is nowhere abrupt, and as far as known offers only ordinary difficulties to the engineer.

Over the range and continuing through to Fort Selkirk the country is known to be level and easily traversed. In summer it is said to be not unlike any prairie country in appearance, abounding in succulent grasses and rich in luxuriant flora. The distance to Fort Selkirk is about 300 miles. Diversions from the Dalton trail are contemplated by the engineers, one from Hootchi, an Indian village about 100 miles from Fort Selkirk, to the Lewis River, down the Nordenskiold Valley, striking the Lewis above Five Finger Rapids at the head of navigation, and another route following the Selwyn River to its junction with the Yukon, 50 miles below Fort Selkirk, avoiding rapids that are dangerous at low water.

The engineers propose to reach Fort Selkirk as soon as possible, and believe that in three months' time they will be able to return with sufficient data to accurately determine the feasibility of a railroad to the Yukon. They will be provided with all the apparatus for observing the meteorological conditions of the region and gathering much other valuable information.

### The Death of George M. Pullman.

Mr. George M. Pullman, the well known car manufacturer, died at his home in Chicago on October 19 of heart trouble. George Mortimer Pullman, who in the old and new world is honored for the invention of the sleeping car, which has greatly reduced the inevitable weariness and discomfort of railroad travel, was born in 1831 at Brocton, N. Y., where his father was a good mechanic. The boy received a common school education and at fourteen entered a country store, which he left at the age of seventeen to learn the trade of cabinet making. The widening of the Erie Canal soon afterward gave him the opportunity of securing the appointment of contractor for moving buildings along the canal. In 1859 he removed to Chicago and engaged in the raising of buildings, at which he was very successful. Not long afterward Mr. Pullman fitted up two cars belonging to the Chicago and Alton Railroad with sleeping berths. These cars were liked and admired, but Mr. Pullman did not push the manufacture of sleeping cars until 1863, and then he turned out his first regular sleeping car, which was named the "Pioneer." The car cost him $18,000. In 1867 the Pullman Palace Car Company was formed, with prominent railroads interested in it. Its original capital was $1,000,000, and is now increased to $36,000,000, so that to-day it is one of the most powerful corporations of its kind in the world. Mr. Pullman will always be remembered by the step that he took when he planned to build a city on the dreary prairie outside of Chicago. This was one of the most daring ventures which an American has ever undertaken. The city was built at an expense of $8,000,000 and has now 12,000 inhabitants, who are comfortably housed in sanitary houses, and there is not a saloon, jail or pauper in the territory. It has proved a wonderful financial success. Mr. Pullman was a typical American inventor, possessing, as he did, the acute perception of what the public needed, and he had an inventive mind which grasped everything that served his purpose.

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## THE HEAVENS FOR NOVEMBER.

BY WILLIAM R. BROOKS, M.A., F.R.A.S.

The right ascension of the sun on November 1 is 14 h. 28 m. 40 s. and its declination south 14 deg. 41 m. 15 s.

The right ascension of the sun on November 30 is 16 h. 28 m. 24 s. and its declination south 21 deg. 47 m. 3 s.

For several days in October the sun's disk has been quite clear from spots, but although in the minimum stage of sun spot activity, it will pay to keep watch for developments of, for the time, unusual character.

### MERCURY.

Mercury is morning star at the opening of the month.

On November 7, at 12 hours, however, Mercury comes into superior conjunction with the sun and changes to evening star.

On November 8, at 8 hours, Mercury is at its descending node.

On November 12, at 2 hours, Mercury is in conjunction with Mars, with Mercury 22 minutes of arc south of Mars.

On November 16, at 7 hours, Mercury will be in conjunction with Uranus, when Mercury will be 1 deg. 4 m. south of Uranus.

On November 18, at 1 hour, Mercury will be in aphelion, or in that part of its orbit most distant from the sun.

On the same date, at 7 hours, Mercury will be in conjunction with Saturn, when Mercury will be 2 deg. 54 m. south of Saturn.

A conjunction of Mercury and the moon occurs on November 24, at 8 h. 31 m., when Mercury will be 2 deg. north of the moon.

The right ascension of Mercury on the fifteenth of the month is 15 h. 42 m 11 s. and its declination south 20 deg. 29 m. 8 s.

### VENUS.

Venus is morning star, and is still the most brilliant object in the eastern morning sky.

The interesting conjunction of Venus and Jupiter in October we trust was observed by many readers of these notes. The very marked brilliancy of Venus over its giant neighbor was particularly striking.

On November 6, at 11 h., Venus arrives at its greatest heliocentric latitude north.

On November 22, at 9 h. 29 m., Venus will be in conjnnction with the moon, when the planet will be 6 deg. 39 m. north of the moon.

On the first of the month Venus rises at 4 h. 23 m. and crosses the meridian at 10 h. 10 m. A. M.

On the last of the month Venus rises at 5 h. 35 m. and crosses the meridian at 10 h. 34 m. A. M.

The right ascension of Venus on the fifteenth day of the month is 14 h. 4 m. 12 s. and its declination south 10 deg. 59 m. 18 s.

### MARS.

Mars is evening star until November 21, on which date, at 7 hours, it comes into conjunction with the sun and changes to morning star.

On November 21, at 4 hours, Mars is in conjunction with Uranus, when Mars will be 24 minutes of arc south of Uranus.

On November 24, at 4 h. 9 m., Mars and the moon will be in conjunction, with Mars 4 deg. 4 m. north of the moon.

On November 27, at 1 hour, Mars will be in conjunction with Saturn, when Mars will be 2 deg. 2 m. south of Saturn.

On the first of the month Mars crosses the meridian at 7 minutes past noon, and sets at 5 h. 8 m. P. M.

On the last of the month Mars rises at 6 h. 56 m. A. M. and crosses the meridian at 11 h. 38 m. A. M.

The right ascension of Mars on the fifteenth day of the month is 15 h. 31 m. 18 s. and its declination south 19 deg. 13 m. 25 s.

### JUPITER.

Jupiter is morning star, and slowly coming into position for telescopic observation, although still at a rather low altitude at dawn.

On November 20, at 10 h. 52 m., Jupiter is in conjunction with the moon, with the planet 6 deg. 24 m. north of the moon.

On the first of the month Jupiter rises at 3 h. 19 m. and crosses the meridian at 9 h. 20 m. A. M. On the last of the month Jupiter rises at 1 h. 48 m. and crosses the meridian at 7 h. 44 m. A. M.

The right ascension of Jupiter on the fifteenth day of the month is 12 h. 14 m. 37 s. and its declination south 0 deg. 20 m. 0 s.

### SATURN.

Saturn is evening star throughout the greater part of the month. On November 25, at 1 hour, Saturn comes into conjunction with the sun, and changes to morning star, but is too near the sun to be visible.

On the first of the month Saturn crosses the meridian at 1 h. 10 m. and sets at 6 h. 3 m. P. M. On the last of the month it rises about 20 minutes before the sun and crosses the meridian at 11 h. 27 m. A. M.

The right ascension of Saturn on the fifteenth day of the month is 16 h. 1 m. 43 s. and its declination south 18 deg. 54 m. 22 s.

### URANUS AND NEPTUNE.

Uranus comes into conjunction with the sun on November 21, at 3 hours, and is therefore invisible. Neptune is approaching opposition to the sun, but does not reach it in November. It is, however, well placed for telescopic observation before midnight.

The right ascension of Neptune on the seventeenth day of the month is 5 h. 24 m. 47 s. and its declination north 21 deg. 48 m. 20 s., and changes its position very little throughout the month.

### ALGOL.

Minima of the variable star Algol will occur as follows in Greenwich mean time:

| | Hour. | Minute. |
|---|---|---|
| November 3 | 22 | 36 |
| 9 | 16 | 14 |
| 15 | 9 | 47 |
| 21 | 3 | 30 |
| 26 | 21 | 7 |

Only alternate minima are given above. Others may be found by using the interval 2 days 20 h. 49 m.

Smith Observatory, Geneva, N. Y., October, 1897.

## Science Notes.

Moscow, in honor of the medical congress just held there, gave $1,000 for a prize to be awarded to some person who has done eminent service to medical science during this generation. On Prof. Virchow's motion, the prize was given by the congress to Henri Dunant, founder of the Red Cross Society, who is living in great poverty in Switzerland.

Dr. Maragliano's serum for pulmonary phthisis, whatever its composition may be, has been used for over a year by reputable Italian physicians with great success, according to the Lancet. Dr. De Renzi, for twenty-nine years professor of clinical medicine in the Naples University, reports forty-four cases of cure by the serum in his hospital cases, while in private practice, when the patients belong to better classes and are not so far advanced in the disease when they first come to the doctor, the results are much better. Dr. De Renzi has found no remedy for consumption superior to this serum.

The German papers record the death of Dr. Hans Hermann Julius Hager at the advanced age of eighty-nine. In early life, after leaving school, he was four years as pupil in an "apotheke" in Salzwedel, and even during that period commenced the literary work by which he afterward became famous. In recognition of the merit of his various publications he was excused his assistant examination. On passing his qualifying examination he took a business at Fraustadt, which he carried on with the assistance of a pupil for seventeen years. He then removed to Berlin and devoted himself entirely to scientific and literary pursuits, in connection with pharmacy. The number of works he produced was very considerable, and several of them were translated into various languages. His services to the art were recognized not only in Germany, but in other countries, and at the time of his death he was an honorary member of thirteen pharmaceutical societies.

To facilitate the study of X rays, A. Imbert and H. Bertin-Sans had a special kind of "photometer" constructed by MM. Ducretet and Lejeune, which consists essentially of a fluorescent screen over which is laid a coarse grating of lead wires and a prism of aluminum. When the X rays examined are feeble, they are only able to penetrate the thin end of the prism, and no shadows of lead wires are visible on the screen except under the thin end. This happens when the vacuum tube is exhausted just enough to give X rays. As exhaustion proceeds more lead wires become visible, and when the tube is on the point of becoming nonconducting the illumination over the whole of the screen is uniform, and the shadows stand out with equal sharpness. At this stage, indeed, aluminum becomes perfectly transparent to the rays, and so do the bones of the hand. This type of rays is particularly well suited for the radiography of the deeper seated anatomy.—Comptes Rendus.

The atomic weight of magnesium has recently been redetermined with great care by Prof. Richards and Mr. Parker, of Harvard, and an account of their results appears in the current numbers of the Proceedings of the American Academy of Sciences. The previous determinations of the atomic weight of this element showed a remarkable inconsistency until the year 1884, when Marignac recorded the results of a large number of closely concordant experiments pointing to the number 24·37. The accuracy of this number has now been confirmed by Messrs. Richards and Parker. The method selected, says Nature, was the analysis of magnesium chloride. The salt was prepared, with great precautions, from the double magnesium and ammonium chloride by heating in a current of dry hydrogen chloride; it was then transferred to a weighing tube, without the possibility of contact with moisture, and the chlorine precipitated by silver nitrate, either gravimetrically or volumetrically, The results of four series of very concordant experiments give the number 24·362 as the atomic weight of magnesium when oxygen is taken as 16·00 or 24·179 if oxygen be taken as 15·88.

## A SCOTTISH BUILT FERRY BOAT FOR NOVA SCOTIA.

BY A. J. SINCLAIR.

On Sunday morning, August 15, the new ferry boat Chebucto left Gourock Bay, Scotland, for Halifax. The vessel returned to Gourock Bay on the forenoon of August 23, having put back from sea owing to the stress of weather. She had proceeded three hundred miles on her journey when the captain deemed it advisable to put back, as the crew did not wish to go any further with the vessel, and, owing to the bad weather and a prevailing adverse wind, he was justified in returning to the Clyde.

The Dartmouth Ferry Commissioners, of Halifax, Nova Scotia, sent out offers toward the end of last year for the construction of a ferry steamer, and it was after keen competition with United States, Canadian, and other shipbuilders that Messrs. John Shearer & Son, Kelvinhaugh Slip Dock, Glasgow, secured the contract to build the vessel. The Chebucto is a vessel of about 600 tons gross and is of a novel type. Both ends are alike, and at each end there is a screw propeller and rudder. The underwater body and ends of the vessel are yacht like in fineness. She was built for special goods and passenger ferry traffic between Dartmouth and Halifax, Nova Scotia.

She is of the following dimensions: Over-all length, 140 feet; between perpendiculars, 125 feet; breadth extreme, 50 feet; breadth moulded, 33 feet; with a moulded depth of 13 feet 7 inches. The main body is constructed of steel to Lloyds highest class, with heavy deck beams, supported by longitudinal truss channel girders, each side of the vessel, for cart and carriage traffic. These beams are carried out in one length to extreme width of vessel, forming the sponson deck. The wings are part of the integral structure, being supported by the outward sweep of the ship's frame and shell plating. On these wings are two spacious houses, each about 100 feet long by 10½ feet wide by 13 feet high, seated all round with handsome curve back settee chairs, divided by electroplated elbows, affording seating accommodation for 222 passengers.

The woodwork of the house is a combination of cherry wood and yellow pine. There are two tiers of windows in the sides, the upper tier being filled in with cathedral glass.

The ornament is very chaste, a fine effect being produced by the introduction of a light band of lincrusta of elegant floral festoon design.

In the center of the vessel a monitor's house is built the whole length of the machinery space, for light and air to the engine room and access to the hurricane deck, the continuation of which to sides forms roofs of side houses. On the hurricane deck two pilot houses (one at each end) are placed, containing steering gear for each end of the ship. Extending over the hurricane deck and embracing pilot houses a light awning deck is fitted, shading a very commodious arrangement of deck seats of elegant construction. A complete installation of electric lighting has been fitted throughout, the pendent electroliers being very handsome. The cabins are heated by a thorough system of steam radiators. The Chebucto is rather a novel vessel, being of the three-decked American type, and there has been nothing built in Britain like her before. In the machinery department the vessel is quite as novel. The engines were supplied by Messrs. McKie & Baxter, Copeland Works, Govan, Glasgow, and consist of two pairs of double compound surface condensing engines, the sizes of the cylinders being 12 and 24 inches in diameter, with a piston stroke of 18 inches.

Steam is supplied at a working pressure of 125 pounds by two Admiralty type boilers (each 7 feet 6 inches in diameter by 18 feet long), each having two of Fox's corrugated furnaces. The boilers were supplied by Messrs. A. Nicholson & Company, Glasgow. There is an installation comprising five pumps, by the Blake & Knowles Steam Pump Works (Limited), including a duplex independent air pump, the first of its kind which has been fitted to a vessel in Britain, a special form of feed pump, a donkey pump, a boiler circulating pump and a sanitary pump. Hancock's inspirators are fitted for feeding the boilers and Hancock ejectors for cleaning the bilges. The air pump discharges into a tank from which the feed draws through a filter, the speed of this pump being automatically controlled by a float. The exhaust steam for all the auxiliary engines is carried to the condenser, and the feed water passes through a heater on its way to the boilers.

The centrifugal circulating pump was made by Messrs. McKie & Baxter, is one of their "Challenge" patterns, and has a special balanced valve, the invention of Mr. Baxter. The engines are reversed by direct acting steam gear upon an entirely new principle, the invention of Mr. Baxter and Mr. D. B. Donald, of Falmouth, and for which provisional protection has been secured. The boilers supply steam to an electric light engine and to the heating appliances throughout the vessel. In all there are thirteen separate engines in the engine room.

The Chebucto was launched at Glasgow on the 30th of June, and it was not until the 12th of August*

*The illustration sent shows her on the trial trip day.

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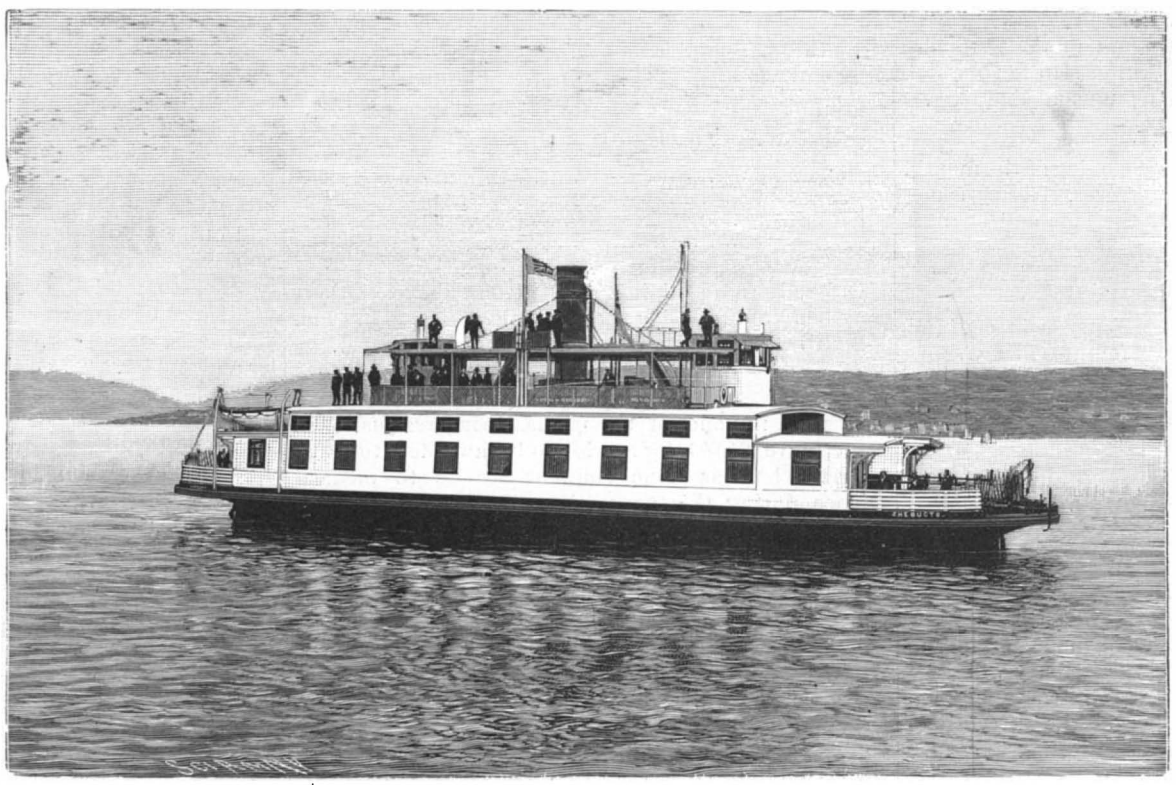
that she ran her official speed trial on the Firth of Clyde. On the invitation of Bailie John Shearer (senior partner of the firm that built the vessel) about fifty gentlemen accompanied the ferry steamer on her trial trip. She did two runs on the measured mile at Skelmorlie with both screws working, and with the engines going 170 revolutions per minute and indicating 400 horse power, she gave a mean speed of close upon 10 knots, which is equal to 11½ miles an hour, which, for a vessel of her class, is a thoroughly worthy performance.

After the trial, the Chebucto proceeded up the river to Glasgow the same evening, where she took on board 200 tons of bunker coal and was made ready for the passage across the Atlantic, her fore and after ends being boarded in and all her windows covered over with planking.



A SCOTTISH BUILT FERRY BOAT FOR NOVA SCOTIA.

## A GREAT PELICAN ROOKERY.

BY C. F. HOLDER.

It has always been somewhat of a mystery where the numerous brown pelicans, so common on the Southern Californian coast, make their headquarters. During the summer months these lumbering birds, which bear so grotesque a resemblance to some of the old pictures of the dodo, come into the little bays alongshore and engage in a vigorous warfare upon the small fry—anchovies, herring, smelt and young mackerel—which are found there in such vast quantities.

The pelicans are very tame and pursue their avocation within a few yards of vessels lying in the bays. Their method of obtaining food is arduous in the extreme, and it is only by continual vigilance that they make a living. In hunting for food they fly heavily, twenty or thirty feet above the water, the long and singular bill, from which depends a capacious pouch, pointing downward, the small brown eyes on the watch for the expectant school of fish. Should it appear, the bird apparently throws itself over, then plunges downward, head first, with mandibles apart. The height of the dive carries the bird in many instances completely out of sight beneath the water, from which it rises in a few seconds, and if it has been so fortunate as to engulf a sardine or several in its capacious mouth, it tosses them up, seemingly from the pouch, by throwing the bill aloft, then swallows the morsels with self-congratulatory wagging of the diminutive tail, suggestive of its satisfaction.

The capture of game is not always a guarantee of a feast. The laughing gull, common in these waters, preys upon the pelican or robs it systematically whenever it can. This it accomplishes by alighting on the pelican's head or back as it rises, and as the clumsy bird attempts to arrange the morsel in its mouth preparatory to swallowing, the gull reaches forward and snatches it from between the long mandibles and flies away with exultant cries.

It has been supposed by many that the brown pelicans make their headquarters in Lower California, coming north in the spring; but during the past season the writer, during a cruise among the islands off Santa Barbara County, found the rookery of these birds. The islands which constitute the group are divided into two series—the Santa Catalina, off Los Angeles County, lying, according to the chart, in what is called the Santa Catalina Channel. These islands include San Clemente, Santa Catalina, San Nicolas and Santa Barbara. Seventy-five miles to the north lies the second division, comprising Santa Cruz, Santa Rosa, San Miguel and Anacapa. The latter is a long, slender, rocky island, rising from the water's edge to a mesa between one and two hundred feet in height at the east end. The highest portion recalled the famous enchanted mesa, as it was evidently inaccessible except by using ropes and a kite.

The island is divided into three distinct portions by the sea. The extreme end is flat, terminating in a pinnacle of rock, while through the center is a lofty arch, high and broad enough to admit the passage of a large yacht, through which the sea runs. The mesa was covered with birds, and as we ran near and fired the yacht's cannon there arose a cloud so vast that it fairly colored the air. Every bird had a long bill, and it suddenly dawned upon us that here was the home of the brown pelican on the Southern California coast. The great ledge of rock, flat on top, was colored white by the guano of the birds, and was distinguishable five or six miles distant. As we approached, the side of the cliff, which formed a slight angle, was seen to be covered with pelicans. They scrambled up the rocks from the lower portions, waddling with bills partly open and wings expanded. As the sound of the gun reached them the very ground seemed to rise, the birds whirling slowly upward in great circles, then slowly settling again.

The rookery, isolated and inaccessible, occupied probably four or five acres, where the birds seemed to be packed in; and that it was an ancient one there was every reason to believe. Here, in all probability, the young are reared in May. At the time of our visit, the middle of August, the rookery appeared to be occupied by old birds and two-thirds grown young.

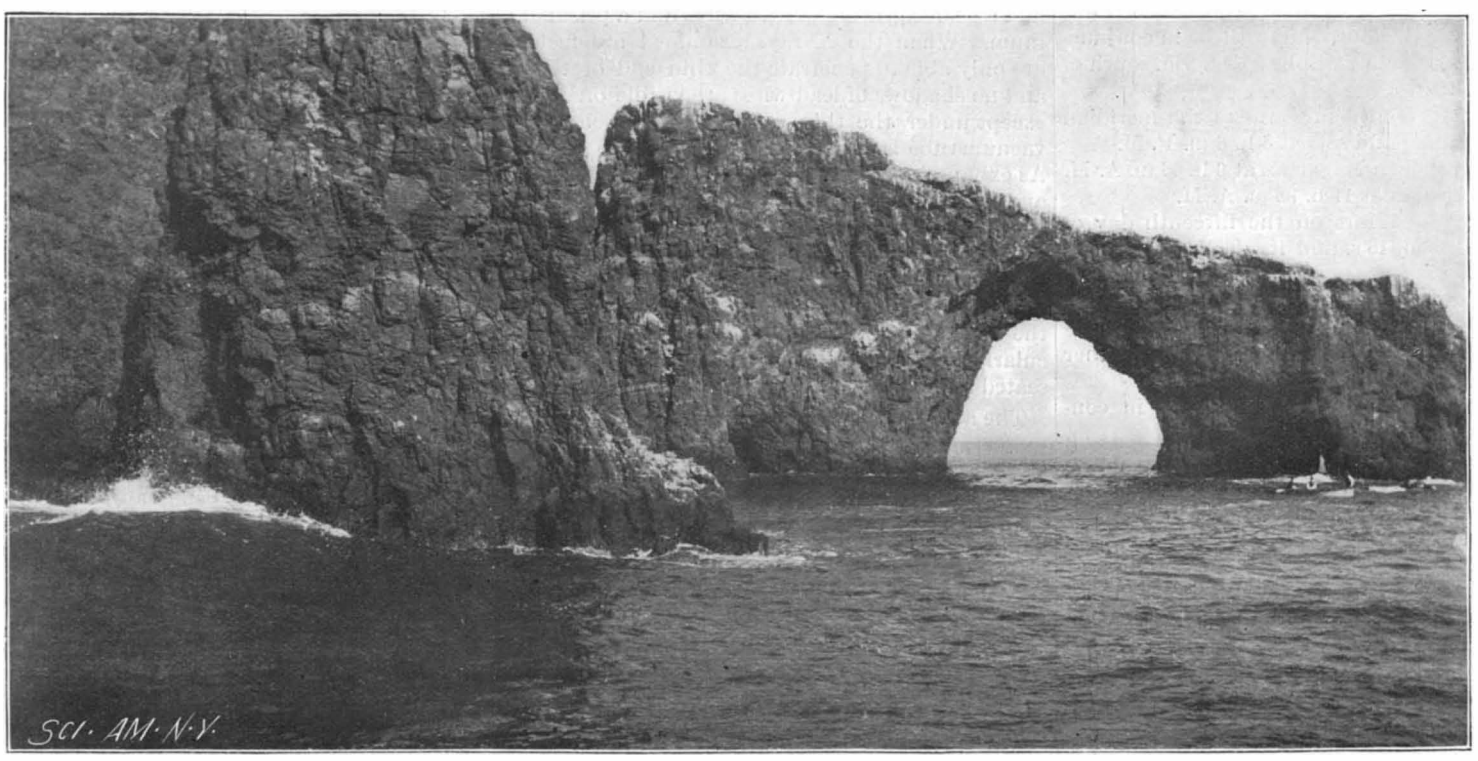
The pelicans here nest on the ground, there being no trees of any kind on this wind-swept island. This is in direct contrast to the brown pelican of the Florida keys, at least in instances observed by the writer, where the nests were in mangrove trees which were growing almost in the water. The nests were of the crudest description, the eggs retaining their position by virtue of good luck.

Not ten miles from the pelican rookery of Anacapa was seen a series of remarkable caves, in the entrance of one of which was a shag rookery. This was discovered by the aid of the odor some distance off. Upon approaching, a remarkable overhanging cliff was seen, the summit of which was possibly 500 feet above the water—a stupendous pile of rock. Near the base it had been eaten away by the sea, leaving a series of rough shelves or ledges which were occupied by shags, old and young.

Leading directly into the cliff was a large cave, whose side entrance was also pre-empted by shags, who were, in the main, two-thirds grown.

After some difficulty, the writer landed and climbed into this rookery. The nests were of kelp and other sea weed roughly thrown together, and strewn about on the rocks were numbers of young birds, some nearly devoured and others partly torn in pieces, showing that some animal preyed upon them. After a careful examination of the surroundings, the writer was forced to think that, half starved, the birds had preyed upon each other and that it was a case of a literal survival of the fittest. On the water in the cave floated numbers of dead young shags which had evidently fallen in, and unable to swim, had been drowned. Yet the young handled were strong and powerful and used their sharp beaks to good advantage.

In the same cave an attractive swallow with white markings was nesting, its nest being fastened to the walls. They were made almost entirely of the feathers of sea birds, covered on the outside with a light clay veneer which made them very heavy and also almost indistinguishable from the rock, this probably being the object of the birds—an interesting instance of protective




A GREAT PELICAN ROOKERY.

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resemblance. The pelicans undoubtedly use the Anacapa rookery as a nesting place, spreading from here up and down the coast to visit the various feeding grounds.

The great arch at Anacapa is of itself a notable object and well worthy a visit, being of large size and presenting a grand and picturesque appearance from either side. It well illustrates the method of disintegration which is going on in these islands, which are all honeycombed in a most remarkable manner, presenting a series of marine caves which for size and interest have no counterpart in this country.

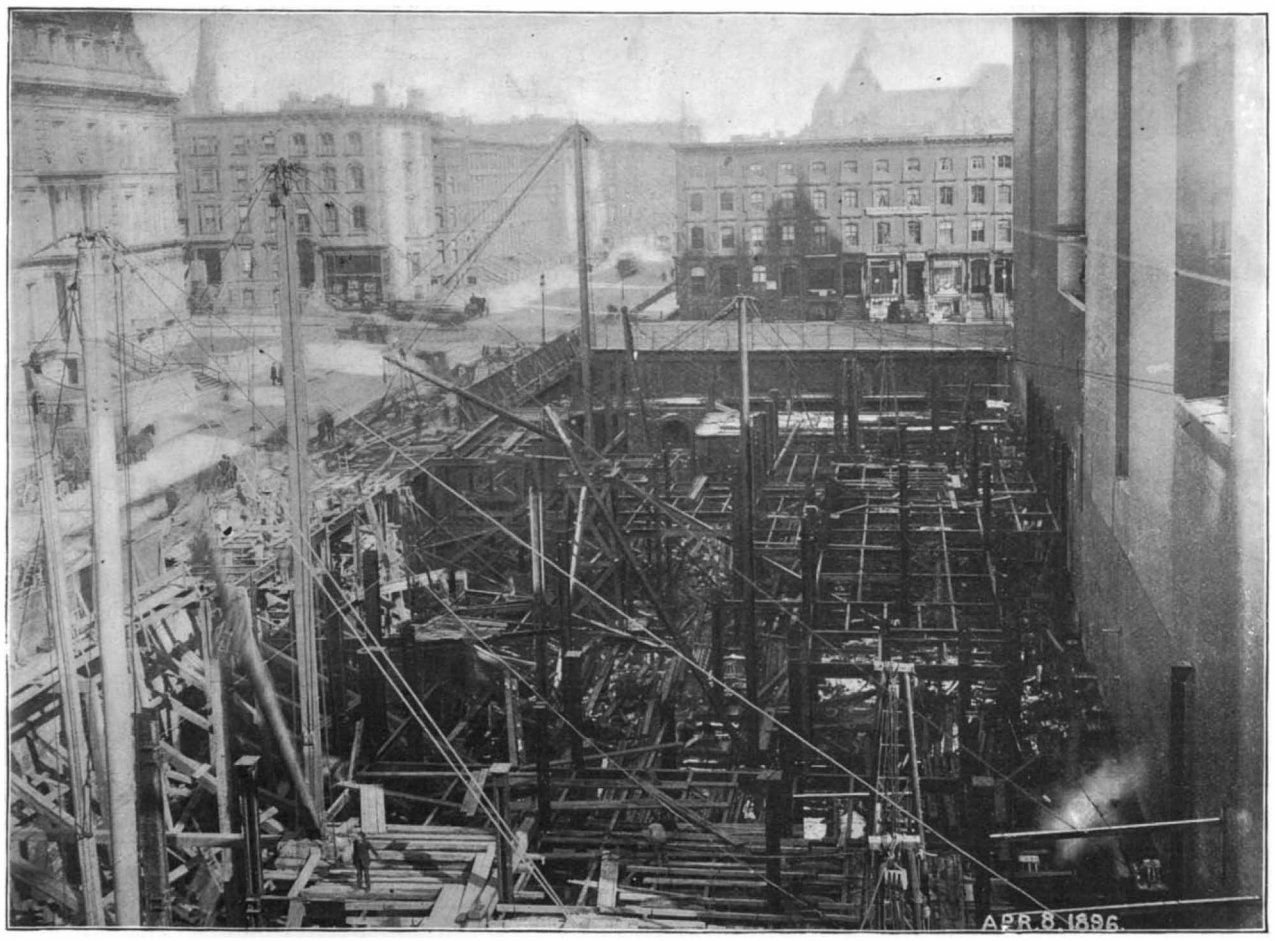
The east point of Anacapa, or the pelican rookery, originally had four arches where there is now one. These gradually were won away until the top fell in, divorcing the section from the island, but preserving the mesa line or angle exact.

## THE ASTORIA HOTEL, NEW YORK CITY.

With the completion of the new Astoria hotel, which adjoins and will be incorporated with the famous Waldorf hotel, this city can boast of possessing the largest and most sumptuous structure of its kind in either hemisphere. The Waldorf-Astoria, as the combined establishments will be called, covers a block of ground bounded by Thirty-third and Thirty-fourth Streets and Fifth Avenue, the present entrance of the Waldorf being on the former street, and the future main entrance of the combined hotel being in the center of the grand façade on Thirty-fourth Street.

In its architectural features and general scheme of decoration the Astoria follows the lines of the Waldorf; but in its magnitude and in the engineering problems involved in its construction it far surpasses the older structure. The external treatment follows the school of the German Renaissance, which style also characterizes much of the interior, though most of the larger and more elaborate rooms are designed in the style of the Italian and French Renaissance.

The exterior view of the combined building, with its vast frontage of red sandstone extending for 200 feet on Fifth Avenue and 335 feet on Thirty-fourth Street, would be imposing for the frontage alone; but when the eye follows through its sixteen stories to the roof line 250 feet above the curb the effect is truly majestic. No such façade was ever planned, certainly none such was ever built, either in ancient, medieval, or modern times.




WORK IN SUB-BASEMENT OF THE ASTORIA HOTEL.

The foundations were in every case carried down to solid rock, the surface of which was found at depths varying from 3 feet to 65 feet below the street level. As none of the foundations were less than 35 feet below the street level, a vast amount of rock excavation was necessary, and where the rock was found below the 35 foot line, the surface was leveled and concrete piers were carried up. Upon the rock or the concrete piers brick piers were built up and capped with granite, and upon these were placed the footings for the columns. It is not necessary to enter into the general structural features of the buildings, as they are of the standard type common to tall buildings of composite steel and masonry construction. There are some novel engineering features, however, which were necessitated by the great size and unobstructed view demanded for certain of the rooms, that call for special mention. The problem was to provide such rooms on the lower floors of the building and yet make provision for carrying the walls of the dozen or fourteen stories above them. The plan adopted was to erect massive steel trusses above the ceiling and incorporate them in the walls which they carried. There are two notable cases in which this has been done. The first occurs above the dining room, which is located on the ground floor on the Fifth Avenue front, and connects with the dining room of the Waldorf. The two rooms will be practically thrown into one, making a vast hall 50 feet wide by 200 feet long. There is a row of columns down each side of the room, the columns standing 6 feet out from the walls. The remaining 38 feet of width is entirely unobstructed by columns, and to carry the great weight of the transverse walls above the ceiling three heavy steel trusses were thrown across from wall to wall. Each truss is 26 feet 8 inches deep and 51 feet 7 inches long, and it is built into the wall which it carries.

Another and even more remarkable structural feat was carried out above the great ballroom, which is situated at the western end of the building. The room measures 85 feet by 96 feet and extends in height through three stories. The two great trusses, of which we give illustrations, had to be made heavy enough to carry the concentrated load of the walls overhead, and as these walls extended through twelve stories, the loads to be provided for were unusually heavy. Each truss measures 84 feet 9 inches between the end piers of the bottom chord and is 51 feet 3 inches deep, the top chord being at the level of, and built into, the fourth floor above the ballroom ceiling. The lower chord consists of four rows of massive eyebars $2\frac{1}{16}$ inches thick by 12 inches deep, with 10 inch pins, the pins at the end posts being 12 inches diameter. The lower half of the end posts is extremely heavy, being made up of $10\frac{3}{4}$ by $29\frac{1}{2}$ inch webplates, two $\frac{1}{2}$ inch by 36 inch cover plates and 12 angles $\frac{1}{2}$ inch by 4 inches by 6 inches. The two trusses are placed 14 feet 9 inches apart and they are connected by diagonal sway bracing. When it is borne in mind that the whole of this trusswork had to be so placed that it would lie within the plane of the walls, and its various members so disposed that they would not interfere with the various corridors and halls of the upper rooms, the work reflects great credit upon the architect, Mr. H. J. Hardenberg, and the engineers, Messrs. Purdy and Henderson.

Before leaving the structural features we draw attention to the photograph showing the massive girder, 7 feet deep, which carries the western end of the big trusses above mentioned. The line of the columns changes at the fourth floor, those above this level not coinciding with the columns beneath. In order to transfer the column loads a line of massive girders was introduced which varies in depth from $4\frac{1}{2}$ feet to 7 feet. The ends of the two big trusses rest upon this girder, which receives one-half of their load. The massive column seen below the girder takes the greater part of this transferred load and is the heaviest in the whole building. The lower section of it carries a load of 5,400,000 pounds, and its weight for 30 feet of its length is 46,980 pounds. There are over 1,600 tons of plate girders in the building, and the total amount of steel work is over 10,000 tons. We are informed that this represents only one-tenth of the cost of the building,—a remarkably low figure when we bear in mind the unusual problems involved in the construction.

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"MUSIC"—BALLROOM CEILING BY E. H. BLASHFIELD.

It has been the aim of the designers of the Astoria to

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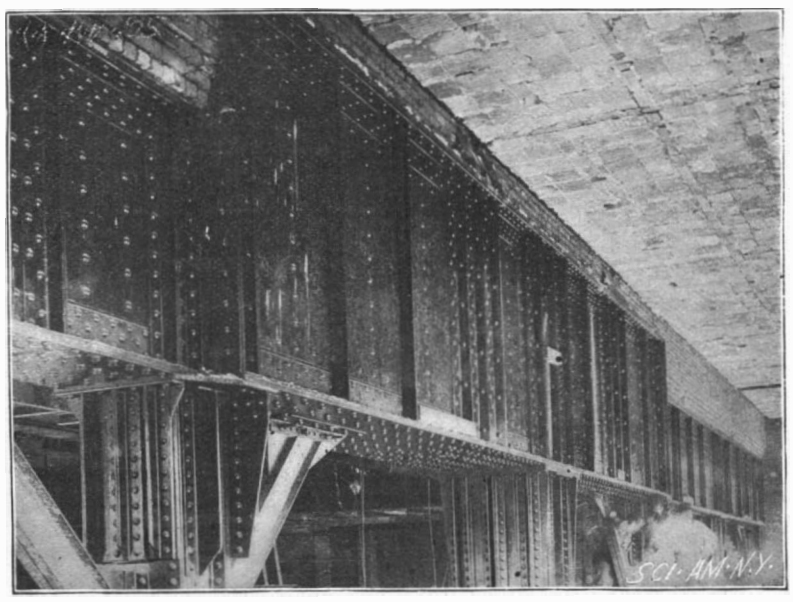
make it something more than the conventional hotel. The manager, Mr. George C. Boldt, who has contributed so largely to the success of the Waldorf, has embodied his ideas in the arrangements, many of them entirely novel, of the new building. He believes that when a guest once enters the hotel he should be able to find within its walls every pleasure and convenience of metropolitan life. Hence the Astoria contains a grand ballroom, a theater, a banqueting hall, a full suite of rooms for wedding celebrations, lecture rooms, clubrooms, and even a hall furnished specially for meetings of secret societies; and upon the roof is a literal German spa where all the best known mineral waters of the world can be obtained, and where the guests can look down upon the city from a promenade which is 90 feet wide, over 200 feet in length, and 250 feet above the street level.

The main entrance to the Astoria is by a semicircular driveway on the Thirty-fourth Street side. The entrance porch is carried on a series of handsome red sandstone columns, the floor is of asphalt and the panels of the ceiling overhead are filled in with green tiling. To the east of the driveway is the ladies' reception room, which measures 50 by 50 feet, and is finished in Sienna marble, with Pompeiian red as the principal color in the decorations. To the east of this is the main dining room, already referred to. This splendid hall is 50 feet wide by 22 feet high and extends for 92 feet along the Fifth Avenue end of the building. The decoration is in the style of the Italian Renaissance, and the row of columns of the marble "of the midnight sun" on each side of the room, together with the richly carved pilasters, produce a very imposing and dignified effect. The walls are paneled in rose Pompadour silk and are enriched with paintings by C. Y. Turner, who painted the well known "Triumph of Manhattan." Two of the figures are shown on our front page engraving. It is the intention, ultimately, to remove the partition between this room and the dining room of the Waldorf, which adjoins it, and when this is done the guests will have an unobstructed view throughout the whole length of 200 feet from Thirty-third Street to Thirty-fourth Street. Passing from the dining room by the main corridor, one enters the "Garden Court of Palms." This is similar to the well known palm garden in the Waldorf, but has considerably more height, as it rises through three stories of the building. The garden measures 38 by 57 feet and it is crowned by a dome-shaped roof of softly tinted glass. The walls are finished in gray terra cotta and Pavonazzo marble and the general style of the decoration is Italian. Three sides of the court have galleries, with carved marble balustrades, and it is connected with the palm garden at the Waldorf by three handsome archways. This room will also be used as a dining hall.

The main office of the building is located directly opposite the driveway, and passing through this to the west, we find the men's reception room, the public billiard room and a bar and café. The café is a handsome room, measuring 40 by 95 feet; the style is that of the German Renaissance, and it is finished in English oak with Flemish decoration. The floor above, at the western end of the building, is occupied by the great ballroom, which is certainly the most spectacular feature of this vast building. Its dimensions, if we include the promenade, are 82 by 95 feet. It is three stories high, and the clear distance from floor to ceiling is 40 feet. The style is Louis Quatorze. At the end it has a stage with a full proscenium, and a seating capacity for an orchestra of 100. The stage is removable, and can be taken away at brief notice. There are two tiers of boxes, capable of seating 250 people, and the floor has seating capacity for 1,100 people. The state boxes face the stage and form the center of the tiers. The appearance of this room will be extremely gorgeous; ivory and rose, rich gilding and hangings of crimson plush are the prevailing fashion of the decorations. The choicest artistic feature of the ballroom is the beautiful ceiling, which has been painted by the distinguished artist Mr. E. H. Blashfield. Two large groups of figures, grouped with the happy effect which characterizes his work, represent respectively Music and the Dance. There are over forty figures in the composition, all of which are above life size, and the central figure in each group is about eight feet from head to toe. On the same floor and at the eastern end of the Thirty-fourth Street side is a banquet hall, known as the Astor Gallery. This is an exceedingly beautiful room, measuring 37 feet by 102 feet, and two stories, or 26 feet, in height. The decorations are carried out in the style of the Hotel Soubise, built in Paris between the periods of Louis Quinze and Louis Seize.

The general color scheme consists of a pleasing harmony of blue, gray, and gold. At one end is a musician's gallery, and down the northern side are seven handsome French windows reaching from floor to ceiling. Here we are introduced to another notable American artist, Edward Simmons, who has enriched the pendentive panels at the base of the curved ceiling and the four panels at either end of the room with characteristic paintings representing the twelve months of the year and the four seasons. This room with its many mural paintings is as striking in its way as the great ballroom itself, and it rivals in chaste beauty the famous rooms in the palaces of France and Italy.




DISTRIBUTING GIRDER UNDER BALLROOM TRUSSES.

A door in the east end of the Astor Gallery leads to the "Myrtle room," designed in the Louis Seize style, and furnished in delicate green and white. This, as its name indicates, is intended for wedding celebrations. East of this is the east foyer, 25 by 55 feet, finished in Caen stone, and beyond this is the east parlor, 32 by 36 feet, rococo in style, with panels of yellow brocade. Returning to the west, one finds opposite the Astor Gallery the Colonial dining room, 40 by 45 feet, finished in crimson and white. To the west again is the ballroom foyer, 38 feet square, standing at the head of the handsome ballroom staircase, with its steps and rails of Sienna marble.

From the third to the thirteenth floor are the bedrooms and suites of apartments. Nearly all of the former have a private bathroom, and the suites with their private entrance halls and many appointments of convenience and luxury are among the finest in existence. On the fourteenth floor is the club foyer snugly upholstered in leather, with a billiard room containing one English and five American tables. On the Fifth Avenue side of this floor is a lecture room with a stage, on which is a range and stove for use in lectures on cooking. The western end of the fifteenth floor is taken up by the great "Sun Parlor," a large hall with an arched and glass-covered roof, furnished with Wakefield rattan furniture and shaded by palms and hanging curtains.

The roof garden, already referred to, has received artistic treatment in the embellishing of the various roof buildings which house in the elevators, tanks, etc. These are decorated in a modified classical style and painted in Pompeiian red. Trellis work has been erected for the training of vines, and the whole will be beautified with palms, evergreens and flowers.

The heating and ventilating plant is claimed to be the most elaborate and costly installed in any existing building. The fresh air is sent through the building by five Sturtevant blowers, one of 12 feet diameter of wheel and four of 10 foot wheel. The exhausting is done by three 9 foot and two 8 foot blowers of the same type and by seven Blackman exhaust fans, varying in diameter of wheel from 3½ feet to 6 feet. The total quantity of air moved each hour is 14,000,000 cubic feet and the fresh air shaft has a cross sectional area of 150 square feet. The air is only moderately warmed, the heating being effected by radiators in each room.

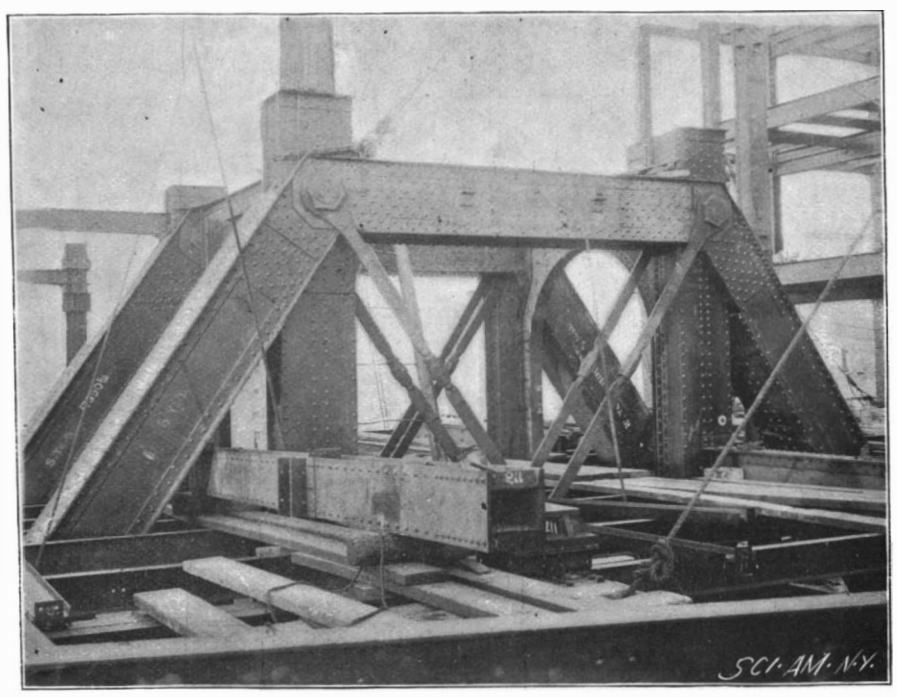
The boiler plant consists of Babcock & Wilcox boilers aggregating some 3,000 horse power. The electrical plant aggregates 2,200 horse power, and electricity is used for lighting, ventilating and elevator service. There are eighteen elevators in the house, including those used for freight.

An idea of the size of the electric lighting installation may be gathered from the fact that it includes 7,500 outlets which serve a total of 15,000 lights. The circuit wiring has been arranged with the object of individualizing each floor or portion of floor, and in some cases even single rooms. The switchboard is 50 feet long and the power and lighting circuits are separately provided for. The generating plant has a capacity of 1,300 kilowatts. It is supplemented by a storage battery giving sufficient reserve to cover all possible emergencies. The generators alone can carry a load equivalent to from 20,000 to 25,000 sixteen candle power lights and the storage battery increases the capacity about 50 per cent. The plant includes four Corliss engines, each direct connected to a 250 kilowatt generator, and two engines driving two 100 kilowatt generators. One-third of the current generated is used to drive the electric motors, which operate the elevators, ventilators, laundry machinery, and other plant in various parts of the building.

The equipment of electric signals, annunciator bells, telephones, etc., is one of the most, if not the most, elaborate in the world. The circuits have been designed with the idea of subdividing each floor into "districts," each of which has its local station. These stations are "interconnected" by trunk lines, and they are also connected with the main central or operating station, which is located on the mezzanine floor. Here the trunk lines converge from all directions. At each floor the lines also converge to a local or floor office. At each local office there are several hundred lines, and the number of lines that converge at the main central office aggregates some four thousand. The connections are such that a call from any room is recorded at both the local floor office and the main central station on the mezzanine floor.

With this notice of the electric and telephone arrangements we must close our description of this sumptuous hostelry. Enough has been said to give some impression of the vast internal construction and economy of a building which can entertain and amuse the occupants of the thirteen hundred rooms of the greatest hotel in existence.

For the information upon which the article is based we are indebted to the courtesy of the architect, Mr. H. J. Hardenberg, of New York.




UPPER HALF OF BALLROOM TRUSSES.

### Unusual Surgical Operation.

A remarkable surgical operation has been performed upon Adrian Dehertoghe, a machinist, of San Francisco. Fifteen yards of silver wire, as large around as an ordinary hypodermic needle, have been introduced into and coiled within his aorta—the arterial channel leading directly from the heart. Those forty-five feet of wire have been in there for three months and, surgeons say, have saved his life. They were inserted at a time when death seemed certain—complications resulting from a severely injured aorta, the patient's trouble being an aneurism or saculated tumor of the arterial wall. Its development to a rupture of the aorta was only a question of time, with instant death as the result, says The Mining and Scientific Press. The wire was introduced into the distended or abnormal sac formed in the aorta, in order partly to fill it and form there a clot that would in time contract and be there absorbed, thereby restoring the channel to its normal formation.

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### "MAGIC FLOWERS."*

A trick that has contributed much toward making one of our leading magicians such a favorite with the fair sex is one in which a bush filled with genuine rosebuds is caused to grow in a previously examined pot that contained nothing but a small quantity of white sand.

After the bush is produced, the flowers are cut and distributed to the ladies, and by many recipients of the magician's favors these buds are looked upon as a production of fairy land. For many years this trick has occupied a prominent position on the programme of the magician in question, and mystifies the audience as much to-day as ever; thus proving how well magicians keep their secrets from the public. The trick is not a difficult one by any means, yet, regardless of its simplicity and the ease with which it may be performed, the florist would find it anything but an economical method of raising roses, as a perusal of the following will show.

On the stage are seen two stands with metal feet, and with long, rich drapery trimmed with gold fringe. On each of the stands is a miniature stand on which are flower pots.

The magician passes the pots for inspection, then places them on the stands, and plants a few flower seeds in each pot. A large cone, open at both ends, is shown and can be carefully examined. One of the pots is covered for a moment with the cone, and on its removal a green sprig is seen protruding from the sand, the seed having sprouted, so the magician says. Now the second pot is covered for a moment with the cone, on the removal of which a large rosebush is seen in the pot, a mass of full-blown roses and buds. The first pot is again covered for a moment with the cone, and when uncovered a second rosebush is seen, equally as full of roses as the other. The cone is once again shown to be empty.

A small basket or tray is now brought forward, on which the roses and buds are placed as the performer cuts them from the bushes, after which they are distributed to the ladies.

The stands are not what they appear. as the drapery does not extend entirely around them, but quite a space at the back of the stands is open. There is a small shelf attached to the stand leg, near the bottom of the drapery. Three cones are used, of which the audience see but one.

The rosebushes are merely stumps to which are attached a base of sheet lead, cut of such a size as to fit nicely in the flower pots, resting on the sand. To the stump the genuine roses are attached by tying with thread. When the bushes are prepared they are suspended inside of cones, by means of a stout cord that is fastened to the stump by one end and to the other end of which is attached a small hook, which hook is slipped over the edge of the upper opening of the cone. When the bushes are placed in the cones, these cones are placed on the shelves at the back of the stands. Reference to the second engraving will make the arrangement of the shelf, back of stand and position of concealed cone plain to all. There is a variance in the size of the cones. The cone shown to the audience is slightly larger than the cone that is behind the first stand, and the cone behind the second stand is a fraction smaller than either of the others. Thus the cones will fit snugly one in the other, in the order named.

After the performer has shown the pots, planted the seed and placed the pots on the small stands, which are used to convince the spectators that there is no connection between the pot and the large stand, he shows the large cone, which is nicely decorated, and covers the top of the pot on the first stand, as he says, to shut out the light that the seed may germinate. Between the fingers of the hand holding the cone he has concealed a small metal shape, painted green, which he drops through the cone into the pot. In a moment he removes the cone from over the pot, and in a most natural manner passes it down behind the stand and over the concealed cone containing the rosebush, and carries this cone away inside of the larger one. At the same moment he picks up the flower pot and carries it down and shows the green sprout in the sand.

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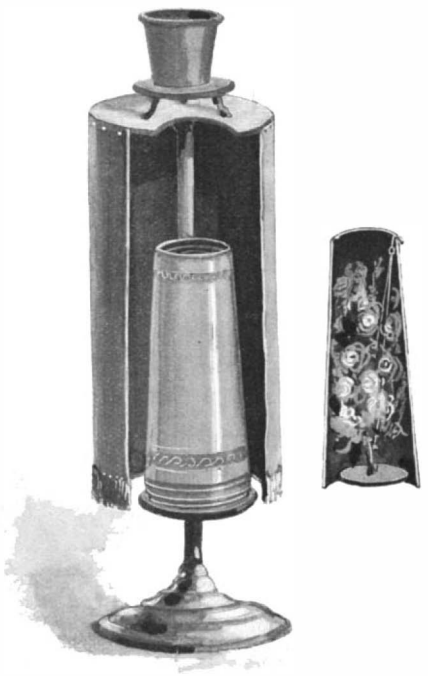
The performer now steps to the second stand and covers the flower pot on it with the cone. As soon as the pot is covered, he slips off the small hook supporting the rosebush, which drops into the pot. The weight of the lead base keeps it in position while the cones are being removed.

When the performer removes the cone—or cones, we should now say, as we have two now in place of one, although this fact is unknown to the audience—he



THE MYSTERY EXPLAINED.

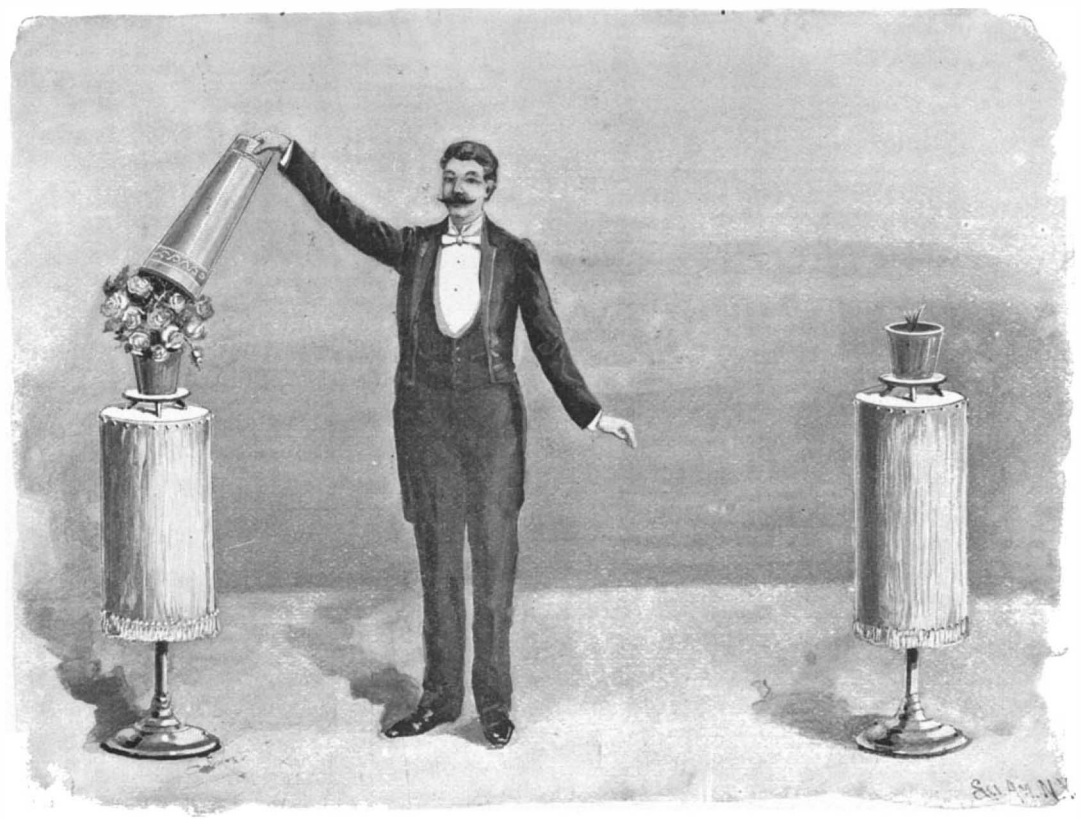
passes it down behind the stand, over the concealed third cone, picking it up with the second rosebush inside. He now returns to the first stand, covers the pot, and, by slipping off the hook holding the rosebush in position and removing the cone or cones, properly, from the pot, shows the second rosebush. He now turns the large cone so the audience can see through it, and as the upper and lower edge of each cone is blackened, there is no danger of the inside cones being seen. The rear of the stand tops are something of a crescent shape to facilitate the passing of the large cone down behind the stand in a graceful manner.

### The Oldest Inclined Plane Railway in the World.

The oldest inclined plane railway in America, and probably the oldest in the world, engaged in the transportation of passengers, is the Mount Pisgah plane, near Mauch Chunk, in the Lehigh Valley, Pa. One of the peculiarities of this place is that the ropes are not hitched to the passenger car, but to a special car or truck, known in the anthracite region by the name "barney." This truck acts as a pusher against the passenger car. It is on the lower side of the car, and thus, when the hoisting machinery is brought into action, the barney is pulled up, and in turn pushes the car ahead. There is a peculiar arrangement on this barney that should be mentioned, namely, instead of two axles, it has four half axles, each with a wheel mounted on it, and these axles are so attached to the truck frame that the wheels may be brought closer together, and thereby the gage reduced, or they may be spread for a wider gage, as the situation may require.

The barney does not stand on the same track as the passenger car, but on a track located within a sloping trench, and this track is considerably narrower than the track on the incline, and also on the ground level upon which the passenger car stands. At the point where the slope begins there is a switch, by means of which the wheels of the barney are adjusted to suit the gage of one or the other of the tracks upon which it is to enter.

When the barney descends into the trench to a depth where it disappears below the ground level, the passenger car is free to move back from the inclined plane. The purpose of this arrangement is to avoid the necessity of permanently hitching the rope to the passenger car, because this latter is not only to travel on this plane, but to continue its journey on two other planes, all of which, combined with several gravity inclines, constitute a circuit by which the tourist travels over three inclines and three intervening slight down grades.—Samuel Diescher, in Cassier's Magazine.



MAGIC FLOWERS.

### The Geographical Society's New Home.

There are many of the cultured residents of New York who are not aware of the scope and functions of the American Geographical Society, yet for half a century its practical enterprise and scientific influences have been felt in all lands and seas of the world. Its officers and the men who have had its assistance and hospitality include some of the most illustrious names in the modern history of discovery, from Humboldt to Stanley, and now this society is about to enter upon a new era with a fund for a plot and building which reaches nearly $400,000. A decision is soon to be reached as to a site, and the form of structure will be determined upon. It is considered desirable that ex-Chief Justice C. P. Daly, who has been president of the Society for thirty-three years, shall preside over the completed structure. The money for the site was largely amassed through his efforts. Like many societies, it started with a humble beginning in the old University building in Washington Square, its founder being William H. Coventry Waddell. Its first president was the historian George Bancroft. The encouragement of the Society was soon sought by explorers like Dr. Hayes, Du Chaillu, Dr. Kane and Captain Hall. Dr. Francis Hawkes succeeded Mr. Bancroft as president, who was followed in turn by Henry Grinnell, who defrayed the expenses of Dr. Hayes to the Arctic regions. The Society was on the point of dissolution when Judge Daly was elected president and Peter Cooper was induced to give the Society space in Cooper Institute for a meeting room and a library. The present house of the Society, 11 West Twenty-ninth Street, was bought in 1875. Since then, by bequests, by surplus revenues above expenses and by the acquisition of the Union Home and School property on the North River, the Society's assets can be placed at $400,000.

The collections in the Geographical Society's house are most interesting and include a large map which was spread before the commissions which signed the treaty of peace between the Colonies and Great Britain in 1783 at Ghent.

The new structure will probably include an auditorium with a seating capacity of 800. This part of the structure will be below the street level. Above on the next floor will be the library with ample accommodation for charts, maps, curios and other collections. Above will be the classified rooms set apart for maps and charts. On the top floor suitable provision for club, dining and other social features will be made.

### A Cable to Iceland.

At its last session, the Icelandic Parliament decided to accept the offer of the Great Northern Telegraph Company in Copenhagen to lay a submarine cable to Iceland from the north of Scotland via the Faröe Islands. The Icelandic Parliament grants an annual subsidy of 35,000 kroner for twenty years. The Danish government has promised ample financial help and active cooperation in the scheme. It is estimated that the cable can be laid early next summer in six weeks. The great trading and fishing industries of Iceland will undoubtedly be benefited by the cable, and meteorologists are looking forward to it with delight.

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## RECENTLY PATENTED INVENTIONS.

### Engineering.

STEAM ENGINE PISTON.—Charles G. Evans, Union, Canada. To prevent all leakage of steam past the piston packing and lessen the friction of the packing rings on the cylinder wall is the object of this invention, according to which the piston is provided with a device for expanding and releasing each of the packing rings, followers on each face of the piston being fitted to slide longitudinally and being rigidly connected with each other, the follower on one side being rigidly connected with the expansion and releasing device on the other side, while a device limits the sliding motion of each follower.

MARINE VESSEL.—Gil Espina, Caracas, Venezuela. Hinged centrally to the bottom of the hull of this vessel is a keel adapted to swing laterally when the vessel rolls, there being operatively connected to the swinging keel a transverse walking beam arranged to swing vertically, and this walking beam actuating a propelling mechanism comprising two swinging paddle frames at the sides of the vessel, transverse paddles being pivoted to the frames. The vessel is also provided with masts and sails, and the keel may be raised laterally and held in horizontal position, as may be necessary in passing over bars and other shallow places.

### Railway Appliances.

FLUID PRESSURE BRAKE.—Herbert S. Smith, San Jose, Cal. This is a device of simple construction, entirely dispensing with the triple valve, and enabling the engineer to release the whole or any portion of the fluid in the train pipe while still having the initial force to apply the brakes, for which the live fluid in the auxiliary reservoir is used over and over again, the permanent charge in the auxiliary reservoir retaining its initial pressure. The brakes are automatically applied in case the train breaks in part, and the engineer has full control for releasing any portion of the brake force he may desire, retaining sufficient pressure to regulate his rate of speed without the use of the retaining pressure valve attached to the triple valve now generally in use. The hissing sound heard on releasing brakes of the present systems is also avoided, there being no discharge of air under the car.

### Electrical.

TROLLEY.—George K. Shryock, Johnstown, Pa. According to this invention two arched spring arms extend up from the ends of the car, making a telescopic connection at the top, whereby the arch may be depressed, and on the extremity of one of the arms is carried a trolley made of spring steel and carrying three trolley wheels, one held vertically under the wire and two diagonally over the wire, thus holding the wire so that it cannot get away. The spring trolley frame allows the two upper wheels to separate automatically when passing cross ties or hangers, or the frame may be expanded by levers from which a cord extends to a convenient point on the car. The device is always ready for use in traveling either forward or backward without any change in its adjustment.

### Bicycles, Etc.

BICYCLE TIRE.—John D. Parker, San Diego, Cal. A thin steel ribbon or band, with corrugated and convex outer surface, has been designed by this inventor, to cover the tread of an ordinary pneumatic tire, and thus prevent puncture. At each side in the edges of the band are notches of liberal size, enabling the band to readily fit around the outer side of the tire, and at sufficient intervals are projections to which may be attached straps for holding the band in place, one end of the band also being reduced in width and thickness to pass through a loop on the inner side of the opposite end of the band, and thus make a slidable connection, so that the band may slightly expand and contract with the varying pressure on the tire.

### Agricultural.

ORCHARD OR VINEYARD PLOW.—Felix Moore, Hanford, Cal. This plow has an angle iron or steel extension frame which may be attached or detached with four bolts, converting the implement into an orchard or vineyard plow, and it may be adjusted to plow four feet outside of the team without any side draught, enabling the orchardist to plow right under the trees without injuring the limbs or knocking off fruit or blossoms. For plowing in vineyards the plow may be set to walk the team in the center of the rows and plow out the whole land or it may be set to straddle the rows. An adjustable push bar is arranged to conveniently push the pole to the right or left and overcome side draught.

POTATO SCOOP.—William A. Reddick, Niles, Mich. In tined scoop blades for handling potatoes, this invention provides an improvement, which consists in so binding the tines at their front ends that they will engage with each other and thus form a continuous edge, on a straight line, the adjoining ends thus fitted together being welded together or not, as desired.

HOE.—John F. Wernicke, Dolton, Ill. This invention provides an improvement in cultivator hoes in which the handles are pushed in front of the operator and have runners or wheels on their lower ends and cultivator blades in the rear of the bearings. The members of the frame are of spring material, and will separate sufficiently not to injure the plants near which the hoe blades may come, there being preferably two blades, one secured to each side portion of the body, and the cutting section of each blade being curved outwardly from the shank. The frame members are brought together or separated as desired by a tension screw.

CHEESE RACK.—John Levey, Lindsay, Canada. This device comprises a frame in which is a series of racks, each having a top and bottom connected by end pieces, journals being secured to the end pieces and gear wheels being carried by the journals at one end of the racks, and the gear wheels meshing with each other, whereby the several racks may be reversed by a hand lever. The device is designed to facilitate the proper drying and curing of cheese with a minimum of hand labor.

### Miscellaneous.

TYPEWRITING MACHINE. — John C. Landis, Middletown, Pa. This is a machine with which any convenient number of letters may be printed by pressing a single key, accurate spacing being effected whether one, two or more letters are printed at one stroke of the key. The machine has supplementary type bars, each having a multiple number of type characters, designed to enable the operator to more readily attain a high speed, there being also an automatic return of the carriage after a line has been written, the speed of the carriage during its return being fully under the control of the operator. The platen is automatically turned during such return movement, to change to the next line, the space between lines being conveniently regulated.

CASH REGISTER. — William J. Ensworth, Erie, Pa. This cash register is adapted to all classes of mercantile service, and embodies a register to show the amount of each individual purchase and a recorder to show the sum of all the purchases. Key levers are provided to actuate the register and recorder, and the cash drawer is projected outward automatically upon the manipulation of any one of the key levers. The machine having, therefore, all the advantageous elements of the present high-priced apparatus, has over them the superiority of extreme simplicity and consequent cheapness.

VEHICLE SHAFT COUPLING.—William A. Jackman, Cheyenne, Wyoming. This invention provides a coupling whereby the forward section of the shaft may be readily and conveniently detached from or attached to a rear section, or a pole may be substituted for shafts. The rear section is formed with a socket in which enters a tongue formed on the forward section, a lock nut being held to travel in the rear section and into the tongue. When the sections have been connected, the joints are practically imperceptible, and the shaft presents the ordinary outward appearance.

DOOR CHECK. — Franklin C. Fisher, Cascade, Col. Devices for keeping the door or gate closed or for holding it open are embodied in this invention, according to which two members are employed, one formed of a curved steel or other spring plate, one end of which is adapted to engage the second member, which is formed of a plate bent to have a round side, with or without a shoulder or plane portion to be engaged by the free end of the spring plate. The device is designed to afford a superior latch for doors and gates of all classes.

TAPE REEL.—John G. Eddy, Brooklyn, N. Y. An improvement in the barrel or post of a tape reel, as provided by this invention, consists essentially in forming the reel hollow and longitudinally slotted, the folded end of the tape to be inserted in the slot and secured to the barrel by a pin or staple within the fold of the tape. The ends of the barrel are fastened to the crank head by projecting pins which enter and are bent down upon a slot in the crank head, there being a washer on the opposite end of the barrel.

FORM CABINET.—Arthur F. Crandall and George W. Byrnes, Beresford, South Dakota. For conveniently holding and keeping classified blank legal instruments, these inventors have devised a cabinet having a pad raised at one side and a number of pad-securing devices at an opposite side, such devices being approximately in the same plane, the cabinet being capable of holding the pad with one edge rested on the pad support and the opposite edge held to prevent edgewise movement, whereby any of the blank forms may be readily detached.

AUTOMATIC BLAST GENERATOR.—Aaron M. Sidwell, Jr., Henderson, Texas. This is a device for the use of jewelers, dentists, etc., to produce a steady and uniform blast which may be increased or diminished as required. A weighted air chamber, with contracted upper end, is arranged to have a regulated downward movement, by means of weights, in a water tank, thereby compressing the air in the air chamber, from which a pipe leads to a blowpipe, the air chamber being conveniently elevated to its starting position each time the air is exhausted.

LETTERING DEVICE. — Lucian Rust, Dunkirk, N. Y. To facilitate making letters, this inventor provides a device in which a circular lettered scale is laid with radial points corresponding with the ordinates of the principal points of the letters, and a sliding bar is provided with a registering bar and a ruling arm, the whole adapted to be moved so that a mark on the registering bar will coincide with the mark to represent the character being formed. The device may be adjusted to form letters of any size and of normal proportions, or with either the horizontal or vertical dimensions increased from the normal.

HANGER FOR VEHICLE BRAKES. — Stanton D. L. Ross, Post Falls, Idaho. This hanger is made in two sections, and is of such construction that the brake lever may occupy a decidedly different position when in use from that it has when not in use, the lever being movable to a position that will remove the brake shoes so far from the wheels as to render it impossible for mud or snow to accumulate between the wheels and the shoes. The hanger is also designed to serve as a bolster guide, preventing the front bolster from swinging either forward or backward.

LOCK HINGE.—August Rentsch, Brooklyn, N. Y. This is a hinge more especially designed for use on shutters, being adapted to securely hold the shutter either in open or in angular positions. It is of very simple and durable construction, can be cheaply manufactured, and may be readily arranged to move the shutter into various positions and lock it when desired.

GATE. — George W. Pettit, Amma, West Va. A gate more especially designed as a farmyard or garden gate has been devised by this inventor, the gate being self-closing, of simple and durable construction, and arranged to move upward on opening to free the bottom of the gate from snow and mud. The gate is also arranged to prevent animals from unlatching and opening it, having two latches arranged approximately at right angles to one another and keepers adapted to be engaged by the latches.

NON-REFILLABLE BOTTLE. — Arthur Pew, Macon, Ga. This bottle has on opposite sides of its neck perforated lugs in which a cross bar is arranged across the stopper, a fender block with metal fastening pins being secured in the stopper to project beyond the lugs. The bottle may thus be so sealed that the contents cannot be removed and the bottle be refilled with other or inferior goods without making such opening apparent, as the lugs must be broken off before the bottle can be uncorked.

CAROUSEL.—Peter J. Spracklen, Kenton, O. The motive power of this carousel is afforded by the persons riding, through pedals or other devices, a frame carrying seats being made to swing around a central standard, as the frame is arranged to receive a rocking movement by the operation of the pedals, and such movement communicating a rotary movement through pawls and ratchet wheels on the central standard.

### Designs.

MONUMENT. — Edwin O. Townsend, New York City. This monument comprises a diamond or octahedron figure supported by a polygonal column, decorated at the top by scroll figures and foliated figures, the column resting on a subbase supported by a main base.

NOTE.—Copies of any of the above patents will be furnished by Munn & Co. for 10 cents each. Please send name of the patentee, title of invention, and date of this paper.

## NEW BOOKS, ETC.

THE AMERICAN SYSTEM OF SHORTHAND. THE MANUAL OF PHONOGRAPHY. By Benn Pitman and Jerome B. Howard. Three hundred and fifty-fifth thousand. Cincinnati: The Phonographic Institute Company. 1897. Pp. 200. Price $1.

This latest edition of the well known "Benn Pitman System" of phonography presents certain advantages over former editions of the work which consist in a somewhat modified and improved order of presenting the several appendages, in the earlier introduction of logograms, and in the addition of a new and copious set of dictation exercises. It is provided with several appendices, one of which presents a scheme of phonographic notation by means of common type, and another an extended alphabet giving sounds that are foreign to the English language. This alphabet will certainly be a great help to those who wish to write other languages without having to study an entirely new system. The book is provided with an index, the plates are very clear, and the text seems to set forth very carefully all that a student of the system will need, so that it will doubtless prove a valuable aid in the acquirement of a system of shorthand.

PRACTICAL NOTES ON URINARY ANALYSIS. By W. B. Canfield, A.M., M.D. Detroit: G. S. Davis. 1896. Pp. 106. 16mo. Illustrated. Price 25 cents.

The importance of urinary analysis is patent to all physicians, but the busy practitioner has no time to search through manuals and make elaborate tests. The writer of the present work has endeavored to show the tried and reliable tests for urinary derangements, and, to all appearances, he has succeeded admirably.

THE MACHINERY OF THE UNIVERSE. Mechanical conceptions of physical phenomena. By A. E. Dolbear. Published under General Literature Committee. London: Society for Promoting Christian Knowledge. New York: E. & J. B. Young & Company. Pp. 122. Price 80 cents.

This is an amplification of a lecture by Prof. Dolbear before the Franklin Institute, in Philadelphia. For thirty years or more the expressions "correlation of the physical forces" and "the conservation of energy" have been common, yet few persons have taken the necessary pains to think out clearly what mechanical changes take place when one form of energy is transformed into another. Little attempt has been made to explain how all phenomena are the necessary outcome of various forms of motion. The present work attempts to present in a concise form the salient facts of the machinery of the universe.

OUR COAL RESOURCES AT THE CLOSE OF THE NINETEENTH CENTURY. By Edward Hull. London: E. & F. N. Spon. New York: Spon & Chamberlain. 1897. Pp. xii, 157. Price $2.50.

This work gives valuable information regarding English, Welsh and Scottish coal fields with special reference to the quantity of coal available. There is also an interesting table giving the quantity of coal mined in the years 1870 to 1896, showing that the increase in 1870 over 1896 was 85,000,000 tons. There is a chapter on foreign coal fields and a forecast of the future. The author is the late director of the Geological Survey of Ireland.

EVERYONE'S GUIDE TO PHOTOGRAPHY. Containing instructions for making your own appliances and simple practical directions for every branch of photographic work. By E. J. Wall. Second edition. New York: Spon & Chamberlain. 1897. Pp. 246. Price 50 cents.

This small book is filled with practical hints for the amateur photographer. The formulas appear to be common sense and the descriptions are very clear. Even the new Roentgen photography is referred to, but this section of the book is of little value, as it is confined to the merest statement of the broad principles of new photography.

THE MONEY QUESTION. A HANDBOOK FOR THE TIMES. By Henry V. Poor. New York: H. V. & H. W. Poor. 1897. Pp. 202.

DAS STABILITATSPROBLEM DES SCHIFFBAUES. Von L. Gumbel. Berlin: Verlag von Georg Siemens. 1897. Pp. 49.

HOW TO BUILD A HOME. The house practical, being suggestions as to safety from fire, safety to health, comfort, convenience, durability and economy. By Francis C. Moore. New York: Doubleday & McClure Company. 1897. Pp. 158. Illustrated. Price $1.

One builds a home, as a rule, once in a lifetime, and unless the owner is an architect or builder by profession, he is liable to make mistakes and overlook many things which conduce to the comfort and safety of the occupants. There are apt to be oversights of little details which, while trifling in themselves, render certain rooms uncomfortable. The writer of the present work has made a study of construction for more than a quarter of a century, and has been careful to preserve memoranda of details which commended themselves to his consideration. It occurred to him it would be well to give others the benefit of what he learned, and the result is a compact little book, brimful of helpful suggestions. Thus, opening the book at random, we find a table of the capacity of cisterns, in United States gallons, calculations being made for each 12 inches of depth. Now a table of this kind, while accessible to the architect, would trouble a layman to obtain. The subjects of hardware, sash weights, etc., all come in for a share of attention, as well as the more important constructive features of the house. Sample specifications for an entire house are also given, and a complete index enables the reader to turn at once to anything in the book. It is a work which can be confidently recommended to all who are thinking of building a house and to all architects. It is very attractively bound in imitation of bark.

THE FOUNDERS OF GEOLOGY. By Sir Archibald Geikie. London: Macmillan & Company (Limited). New York: The Macmillan Company. 1897. Pp. x, 297. Price $2.

This is an important work by the Director-General of the Geological Survey of Great Britain and Ireland. They are lectures given at the Johns Hopkins University, republished in book form. No more appropriate theme could have been selected for these lectures than the story of the evolution of geology. The period selected is from the middle of the last and the close of the second decade of the present century, an interval of about seventy years. This period is full of peculiar interest in the development of science, for it witnessed the laying of the foundations of geology. The chapters, or rather lectures—six in number—deal with the cosmogonists, the rise of volcanic geology, history of the doctrine of geological succession, rise of the modern conception of the theory of the earth, the rise of stratigraphical geology, and the transition or Greywacke formation, resolved by Sedgwick and Murchison into Cambrian, Silurian and Devonian systems. The influence of Lyell and Darwin is also considered.

BEET SUGAR ANALYSIS. A complete system of instruction for analysis in beet sugar factories. By Elwood S. Peffer. Chino, Cal.: E. C. Hamilton. 1897. Pp. 224. Price $2.50.

In our issue of July 31, 1897, we described the very interesting and important plant of the Chino Valley Beet Sugar Company. We now take great pleasure in reviewing the excellent book by Mr. Elwood S. Peffer, of the Chino Valley Company. Beet sugar has certainly a great future ahead of it, and with the establishment of the industry reference books will become a necessity, and the present manual was written in the hope it would prove of value in the very important matter of chemical control of the factory. It is intended primarily as a complete school for a beginner, but the experienced chemist will find in it much to interest him. All of the descriptions of the various processes and tests are written in a remarkably clear manner. Examples are given of the various calculations. On the whole, we are inclined to regard this book as a most important contribution to beet sugar literature.

INTROD CTION TO THE STUDY OF ECONOMICS. By Charles Jesse Bullock. New York, Boston, Chicago: Silver, Burdett & Company. 1897. Pp. 511. Price $1.40.

This book is designed as an introductory text book for economical science. The first three chapters aim to familiarize the student with an orderly treatment of some leading facts in the economic history of the United States before the study of economic theory is commenced. Throughout the book economic principles are discussed with special reference to American conditions, and their workings are illustrated with frequent allusions to American experience. The chapters treat of the growth of fundamental industries, manufactures and transportation, the consumption of wealth, the theory of exchange, money, money and credit, monopolies, international trade, the wages system, socialism, functions of the government, etc.

THE PRACTICAL RUNNING OF AN ICE AND REFRIGERATING PLANT. Illustrated by Paul C. O. Stephansky. Boston: Angel Guardian Press. 1897. Pp. 116. Price $2.

This book is specially written for the purpose of educating the engineer more thoroughly in the practical running of an engine and refrigerating plant. The many points, with illustrations shown therein, will, after a careful study, enable the reader to embrace the many opportunities offered for the practical running of machinery of this kind. It is with this object in view that the author has undertaken this work. To all appearances it is a thoroughly practical and useful work.

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## Business and Personal.

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The celebrated "Hornsby-Akroyd" Patent Safety Oil Engine is built by the De La Vergne Refrigerating Machine Company. Foot of East 138th Street, New York.

The best book for electricians and beginners in electricity is "Experimental Science," by Geo. M. Hopkins. By mail, $4. Munn & Co., publishers, 361 Broadway, N. Y.

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## Notes & Queries

### HINTS TO CORRESPONDENTS.

**Names and Address** must accompany all letters or no attention will be paid thereto. This is for our information and not for publication.

**References** to former articles or answers should give date of paper and page or number of question.

**Inquiries** not answered in reasonable time should be repeated; correspondents will bear in mind that some answers require not a little research, and, though we endeavor to reply to all either by letter or in this department, each must take his turn.

**Buyers** wishing to purchase any article not advertised in our columns will be furnished with addresses of houses manufacturing or carrying the same.

**Special Written Information** on matters of personal rather than general interest cannot be expected without remuneration.

**Scientific American Supplements** referred to may be had at the office. Price 10 cents each.

**Books** referred to promptly supplied on receipt of price.

**Minerals** sent for examination should be distinctly marked or labeled.

(7222) G. M. M. writes: May I not ask you a few questions about the little alternating current dynamo described in your issue of Sept. 11th? 1. Can the body or ring be made of band iron welded together and shrunk on to each other, or wound up and riveted, and in that way make up the thickness? A. Band iron strips rolled and welded together and shrunk on in layers would answer the requirements electrically, but would require additional work and would not be as good mechanically, as this construction would require the bearing plates being bolted on the sides, which is a less rigid method than bolting through the edge of a solid ring. 2. Will wrought spool studs, without such big heads and no nuts, do just as well? Will cast brass spools do? A. Wrought iron studs with smaller heads would answer in place of bolts if you have devised an approved method of attaching them to the iron ring. 3. Cannot the bearing plates be cast iron or brass and bolted to the sides of the ring instead of on the edge? A. If cast brass spools are used they must be turned down as thin as the built up spools in order to hold the same amount of wire. If the brass coil is thicker, the magnet will be further from the coil and less active. 4. Will the linear measure you give answer for enlargement to double or treble the size machine? A. The measurements given may be enlarged to twice or three times the size, but bolts and fittings must be enlarged in proportion also, as well as the thickness of the ring, etc. 5. Would sheet iron, say 20 or 24 gage, do for the armature on a larger machine? A. The sheet iron for the armature must be the thinnest procurable for efficiency. An armature for an alternator built from thick iron sheets is very wasteful. 6. Will wrought iron or soft steel do as well as brass on any part of the machine? A. Wrought iron or soft steel will answer in place of brass, for bearing plates and trimmings. 7. Would larger gage wire be best for a larger machine? A. Wire for a larger machine must be determined by calculation. Wire for the larger armature is a matter of requirements of the machine, and must be worked out by one familiar with the designing of dynamos. 8. Will this dynamo work as a motor? A. The machine is not intended to act as a motor. Single phase generators may be made to run as motors by putting them "in step" with a proper alternating current, as they are not self-starting.

(7223) C. V. S. asks: 1. Will you please give me a cement that will stand alcohol? A. For a cement which will resist alcohol use the best glue; pour on it an equal quantity of water, let it soak over night and then add fine Paris white or white lead. Mix well and add a little acetic acid, carbolic acid or oil of cloves. 2. What kind is used in fish aquarium? A. We can send you two papers on receipt of twenty cents which will give you formulas for aquarium cements. 3. Can you tell how to solder glass, and if it is practical to do so? A. Soldering glass and porcelain with metals may be performed by M. Cailletet's process as follows: The portion of the tube that is to be soldered is first covered with a thin layer of platinum. This deposit is obtained by covering the slightly heated glass, by means of a brush, with very neutral chloride of platinum, mixed with essential oil of chamomile. The oil is slowly evaporated and, when the white and odoriferous vapors cease to be given off, the temperature is raised to a red heat. The platinum is then reduced and covers the glass tube with a bright layer of metal. On fixing the tube thus metallized, and placed in a bath of sulphate of copper, to the negative pole of a battery of suitable energy, there is deposited upon the platinum a ring of copper, which should be malleable and very adhesive if the operation has been properly performed. In this state, the glass tube covered with copper can be treated like a genuine metallic tube and be soldered by means of tin to iron, copper, bronze, platinum, and all metals that can be united with tin solder. The resistance and strength of such soldering are very great. M. Cailletet has found that a tube of his apparatus for liquefying gases, the upper extremity of which had been closed by means of an adjutage thus soldered, resists pressures of more than 300 atmospheres. The tube, instead of being platinized, may be silverized by raising the glass covered with nitrate of silver up to a heat bordering on red. The silver thus reduced adheres perfectly to the glass, but numerous experiments have caused platinizing to be preferred to silverizing in the majority of cases.

(7224) N. F. asks: Will you kindly inform me through Notes and Queries how to silver glass by nitrate of silver process, also if a gold deposit can be put on, and by what process? Refer me to any SUPPLEMENTS on the subject. A. Good formulas for silvering glass are given in the SCIENTIFIC AMERICAN SUPPLEMENT, Nos. 105, 501, 895 and 1006. Information on the electrogilding of glass will be found in SUPPLEMENT, No. 86, price 10 cents each by mail.

(7225) N. S F. writes: I want to make a small camera, using a single achromatic lens, capacity 4×5. The focal length will, I suppose, be about 6 or 7 inches, and I propose to use three stops, 1/8, 1/16 and 1/32 focus. 1. How far in front of the lens should the stops be placed? A. Near; say 1/8 inch. 2. How much range should I give the sliding parts to focus from 5 to 50 or 100 feet? A. About 2 inches. 3. Should the lens be mounted with the convex part in front like a telescope or with the plane face front? A. Plane face in front. 4. If I should want to use the same lens for an enlarging camera, should the face that is front in the photographic camera face the negative or the enlargement? A. Plane face in front.

(7226) C. S. says: Please inform me through the SCIENTIFIC AMERICAN, in the Notes and Queries columns, of the numbers of SCIENTIFIC AMERICAN and SCIENTIFIC AMERICAN SUPPLEMENT containing illustrations of modern war vessels. A. In our SUPPLEMENT catalogue, which is mailed free to any address, you will find a large number of illustrations of war vessels listed and arranged according to countries. We shall be pleased to furnish to prospective purchasers of the paper lists of the vessels which have been published in the SCIENTIFIC AMERICAN.

### TO INVENTORS.

An experience of nearly fifty years, and the preparation of more than one hundred thousand applications for patents at home and abroad, enable us to understand the laws and practice on both continents, and to possess unequaled facilities for procuring patents everywhere. A synopsis of the patent laws of the United States and all foreign countries may be had on application, and persons contemplating the securing of patents, either at home or abroad, are invited to write to this office for prices, which are low, in accordance with the times and our extensive facilities for conducting the business. Address MUNN & CO., office SCIENTIFIC AMERICAN, 361 Broadway, New York.

## INDEX OF INVENTIONS

**For which Letters Patent of the United States were Granted**

**OCTOBER 19, 1897,**

**AND EACH BEARING THAT DATE.**

[See note at end of list about copies of these patents.]

Adding machine, typographical, T. A. Trent, Jr.. 591,900
Air or water wheel, S. Crocker.... 592,080
Amalgamating apparatus, L. Baudendistle.... 591,943
Animal trap, J. B. Davis.... 591,956
Automatic coupling for railway wagons, etc., A. Rushforth.... 592,210
Automatic switch, G. Bansall.... 592,043
Bag. See Seamless woven bag.
Baking pan, bread, C. W. Kolb.... 592,058
Ball trap, Wells & Wambsgans.... 592,221
Banjo or similar musical instrument, H. O. Kellogg.... 591,844
Bearing, antifriction, C. W. Hunt.... 592,053
Bedsteads, detachable joint for metallic, C. P. Dyer.... 591,960
Beehive, J. Q. Tucker.... 592,180
Bell clamp, bicycle, H. S. Pullman.... 592,098
Bicycle, S. H. Phelps.... 592,122
Bicycle, J. C. Raymond.... 592,169
Bicycle attachment, J. H. Meyer.... 591,864
Bicycle brake, G. A. Johnson.... 591,974
Bicycle brake, Warren & Jones.... 591,994
Bicycle crank mechanism, H. I. Schanck.... 592,174
Bicycle driving gear, J. E. Martin.... 592,156
Bicycle handle bar clip, E. H. Olds.... 592,018
Bicycle stand, P. Hiekisch.... 591,969
Bicycle support, J. G. Cronbach.... 591,820
Bicycle support or rack, H. S. Frambes.... 592,086
Bicycle trainer, S. H. Law.... 592,093
Bicycle wheel, W. H. Kadel.... 591,922
Bicycles, automatic guiding attachment for, H. Q. Plummer.... 591,930
Bicycles, combination bracket and luggage carrier for, G. W. Weber.... 591,904
Binder, temporary, H. E. Dade.... 592,082
Blacksmithing apparatus, Brewer & Shenk.... 592,193
Blank for commercial reports, H. E. O'Neill.... 591,875
Blind, slat, C. R. Friedrich.... 591,918
Block and signal system and brake automatic appliance, combined automatic, J. G. Pearce 592,120
Blower and screen, adjustable fire draught, P. W. Hurndall.... 592,114
Boiler. See Sectional boiler.
Boiler cleaner and feed water heater, automatic, J. J. Long.... 591,856
Boiler furnace, steam, H. E. Parson.... 592,205
Book or pad, manifold sales, P. Hano.... 592,141
Book, scrap or stub, A. L. Weis.... 592,103
Boot or shoe, A. Gross.... 592,140
Bottle, F. Johnson.... 591,842
Bottle cap, S. E. Kinnan.... 591,849
Bottle, ink, A. C. Anderson.... 591,802
Bottle, non-refillable, Black & Sander.... 592,189
Bottle, non-refillable, A. H. Meech.... 592,157
Bottle stopper, P. Dillon.... 591,824
Bottles, device for preventing refilling of, O. R. Van Vechten.... 591,902
Bottles, means for preventing refilling of, A. F. Chace.... 592,223
Box. See Match box. Miter box. Window box.
Brace. See Furniture brace.
Brake. See Bicycle brake. Vehicle brake.
Brake mechanism, H. S. Goughnour.... 591,836
Brazing apparatus, Lewis & Bailey.... 591,982
Bridge, D. E. Fisher.... 591,832
Broaching implement, W. A. McCool.... 591,871
Buckle, G. E. Davis.... 591,955
Butter cutter, C. H. Hoffmann.... 591,970
Butter, making, R. C. Bearden.... 592,215
Button and tie retainer, combined collar, J. W. Knause.... 591,978
Button, self attaching, N. D. Ingram.... 591,973
Cabinet, portable newspaper, R. O. Stutsman.... 592,177
Camera holder, I. F. Pheils.... 591,877
Can. See Oil Can.
Can opener, S. M. Wright.... 592,129
Car coupling, Dague & Gregg.... 592,132
Car coupling, Frommann & Enck.... 591,919
Car coupling, S. McCammant.... 591,927
Car frame draught rigging, Roberts & Spalding.... 592,171
Car signal, C. E. Miller.... 592,158
Cars, automatic latch mechanism for dumping, J. A. & A. J. Morrison.... 592,063
Carding machine automatic feeding mechanism, H. Field, Jr.... 592,135
Carpet stretcher, J. E. Drake.... 591,826
Carriage, folding baby, Craig & Taylor.... 592,079
Cartridge cases, die for making, W. Mason.... 592,095
Cash drawer register, E. W. Pitcher.... 592,208
Caster wheel, J. Harrington.... 592,201
Catching and holding tool, J. C. Vickrey.... 592,030
Cement kiln, H. Campbell.... 591,813
Centrifugal machine, Laidlaw & Matthey.... 592,147
Chain, cycle or other drive, L. S. Crandall.... 591,819
Chopper. See Cotton chopper.
Churn, J. Bennett.... 592,216
Churn dasher, H. H. Sheely.... 592,175
Cigar clipper and register, combined, T. A. Cole.... 592,106
Cigarettes, etc., holder for, H. H. Kerr.... 591,845, 591,846
Cinder extractor, P. G. Leonard.... 592,011
Circuit breaker, automatic magnetic, W. M. Scott.... 592,100
Clamp. See Bell clamp. Curtain clamp.
Cleaner. See Boiler cleaner. Window cleaner.
Closet. See Dry closet.
Clothes line support, C. L. Schwalm.... 592,099
Clothes wringer, P. Irons.... 592,202
Coat, L. Graner.... 592,200
Coat, G. Listmann.... 592,149
Cock box, stop, T. J. Ryan.... 591,884
Coin controlled apparatus, R. E. Ebersole.... 592,004
Contact device, traveling, E. Lundqvist.... 592,150
Controller, T. Von Zweigbergk.... 592,104
Coop, poultry, Bumpass & McCandlish.... 592,194
Corn sheller cob stacker, J. H. Gilman.... 592,111
Cotton chopper, R. R. Hyland.... 591,972
Coupling. See Car coupling. Insulating coupling.
Crate, folding egg, J. S. Lewis.... 592,059
Crushing machine, C. Skinner.... 591,890
Crushing machine, C. & F. B. Skinner.... 591,891
Culinary device, T. Mayhew.... 592,096
Culvert, arch, G. M. Cheney.... 591,949
Curtain clamp, F. A. Herrick.... 591,921
Curtain pole and shade roller bracket, combined, W. C. Houser.... 592,113
Curtain pole appliance, J. P. S. Lyons.... 592,152
Cutter. See Butter cutter.
Cycle, ice, R. Von Nagy de Markovitz.... 591,990
Cycle lock, Dickinson & Fisher.... 591,823
Cyclone refuge, R. T. Bond.... 592,190
Delivery slip holder, F. T. Clark.... 591,950
Desk, writing, G. H. Rogers.... 591,882
Die and die stock, Bascom & Martin.... 592,044
Digging beets, etc., machine for, K. Thomann.... 592,126
Ditching machine, O. R. Smith.... 592,101
Door butt gage, V. B. Staples.... 592,026
Dress shield, H. Lemmermann.... 591,981
Drier. See Hair drier.
Drill, W. J. Hatton.... 592,142
Drill jar, H. F. Seybert.... 592,024
Drill press, H. Dreses.... 592,048
Drilling machine, hand, B. F. Smith.... 592,213
Dry closet, F. J. Curtis.... 592,107
Dry pipe sprinkler system, J. F. Miller.... 591,865
Dyeing mixed goods, H. N. F. Schaeffer.... 592,022
Egg tester, D. W. Hughes.... 591,971
Electric conductor wire connector, I. Shultes.... 592,025
Electric controller, H. G. Reist.... 591,879
Electric transformer, W. S. Moody.... 591,869
Electrical current interrupter, H. W. Mather.... 591,861
Electrical traction, W. Kingsland.... 592,056
Electrode, storage battery, H. S. Lloyd.... 591,855
Electrolytic apparatus, Moebius & Nebel.... 592,097
Electromagnetic engine, W. M. Storm.... 591,897
Engine. See Electromagnetic engine. Explosive engine. Fluid pressure engine. Gas engine. Rotary engine. Steam engine.
Engine, P. & M. E. Schmit.... 592,023
Engines, connecting rod end for, F. F. Fischer.... 592,109
Explosive engine, Cummings & Hilton.... 591,952
Explosive engine, C. W. Weiss.... 592,033, 592,034
Extractor. See Cinder extractor.
Fans, system of, E. S. Dunn.... 591,959
Fastening device for gloves, etc., W. B. Murphy 591,989
Feed water heater, W. & W. A. Clark.... 591,816
Feed water heater, H. E. Parson.... 592,206
Feeder, automatic boiler, A. T. MacCoy.... 592,061
Feeder, continuous boiler, A. T. MacCoy.... 592,062
Fence, flood, J. M. & J. W. Bird.... 592,188
Fence gage, wire, D. W. Aylworth.... 591,803
Fence, hedge, M. Neil.... 591,874
Fence implement, wire, I. N. Peck.... 592,165
Fence machine, W. N. Parrish.... 591,928
Fence post, C. H. Kempton.... 592,146
Fence, wire, A. B. Probasco.... 592,020
Fencing, machine for making wire, A. J. Bates.... 591,996
Fertilizers, apparatus for making, A. Morris.... 591,987
Fifth wheel, Mitchell & Perry.... 591,867
Firearm, breech loading, A. A. Clive.... 592,196
Fireplace back, S. J. Reynolds.... 591,931
Fireproof floor, R. A. Kinkele.... 592,117
Fish drying apparatus, A. Morris.... 591,986
Flower pot, M. Simpson.... 592,066
Fluid pressure engine, F. F. Fischer.... 592,108
Fluid pressure machine, C. H. Johnson.... 592,115
Fluid pressure regulator, D. J. & S. Farmer. 592,197, 592,198
Fluid pressure regulator, Rigling & Mayers.... 591,881
Fluid pressure regulator, Sharpneck & Knox.... 592,212
Fruit stoning device, H. Willard (now by marriage H. W. McNair).... 591,942
Funnel, automatic, J. F. Sprain.... 591,894
Furnace. See Boiler furnace. Heating and roasting furnace. Plumber's or brazier's furnace. Smelting furnace.
Furnace, E. S. Rogers.... 592,065
Furnace, W. Tomilson.... 591,993
Furnace blast pipe, steel, H. E. Parson.... 592,204
Furnaces, rake appliance for ore roasting, J. W. Hegeler.... 592,006
Furniture brace, G. M. Spence.... 591,938
Fuse box, A. W. France.... 591,917
Gage. See Door butt gage. Fence gage.
Game apparatus, S. Crocker.... 592,081
Game apparatus, C. A. French.... 592,087
Game counter, A. P. Cole.... 592,047
Game counter, W. C. James.... 592,054
Game device, Emerson & Hilcken.... 591,961
Gas apparatus, J. H. Baker.... 592,185
Gas engine, P. Auriol.... 592,073
Gas engine, C. L. Mayhew.... 591,862
Gas fixture, self locking, Whittier & Landers.... 592,183
Gas generator, acetylene, J. C. Dupee.... 592,083, 592,084
Gas generator, acetylene, D. S. Williams.... 592,035
Gas generator and burner, O. P. Talley.... 592,102
Gate. See Railway gate. Railway crossing gate.
Generator. See Gas generator.
Gin saw, J. M. Gardner.... 592,137
Gin saw filing machine, J. M. Beavers.... 592,045
Glass beveling machine, R. A. Schlegel.... 591,936
Glassware, manufacture of, W. Buttler.... 592,078
Globe holder, W. F. Malloy.... 591,984
Glove, S. L. Luther.... 592,060
Glue kettle, E. L. Root.... 591,933
Governor, fluid pressure controlled, A. W. Cash 591,815
Grain door, J. Watson.... 591,940
Grinding mill, C. Munson.... 591,988
Hair crimper, M. Fischhater.... 592,049
Hair drier, H. V. Halliwell.... 591,966
Hammer, pneumatic, C. H. Johnson.... 592,116
Handle for screw drivers, etc., L. M. Devore.... 591,913
Harvester, corn, L. W. Bell.... 591,805
Head rest, A. M. Denham.... 592,002
Heater. See Feed water heater. Wheat heater.
Heating and roasting furnace, W. E. Roberts.... 592,220
Hinge, door, H. Kiessling.... 591,847
Hoe, push, G. H Grapes.... 591,837
Hook. See Link hook.
Horse hopple, D. S. Minton.... 591,866
Horse stopping device, O. Lundberg.... 591,983
Horseshoe bar and blank, W. A. Sweet.... 592,178
Hose, air brake, McCauley & Johnson.... 592,017
Impact tool, T. H. Phillips.... 592,166
Incandescents, manufacture of, C. G. Richardson.... 592,209
Incubator, F. H. Morgan.... 591,870
Index cutting and printing machine, W. Corfe.... 591,818
Indicator. See Speed indicator. Station indicator.
Ink well, M. G. Gross.... 591,965
Insulated electric conductor and apparatus for making same, J. D. Bishop.... 591,997
Insulating coupling for electric wire conduits, L. McCarthy.... 592,016
Ironing table, A. Perkins.... 591,929
Jars, cans, etc., holder for, H. Lewis.... 592,012
Jointing mains, pipes, etc., means for, D. J. R. Duncan.... 591,828
Journal bearing, car, W. R. & J. R. Bowker. 591,807, 591,808
Kiln. See Cement kiln.
Knife. See Skinning knife.
Knitting machine, J. L. Eck.... 592,134
Ladder and chute for fruit gathering, G. K. Davis.... 592,133
Ladder, extension, C. H. Waterman.... 592,182
Ladder for fire escapes, etc., folding, W. Beckett 591,944
Lamp chimney protector, H. Regensburger.... 592,170
Lamplighter, time, D. & D. Rogers.... 592,173
Lasting boots or shoes, notching device for, G. W. Carter.... 591,999
Lock. See Cycle lock.
Leg band or guard, L. B. Sharp.... 591,889
Link hook, J. H. Cook.... 591,971
Liquids and gases, apparatus for mixing, R. G. Ferguson.... 591,830
Liquids with gases, apparatus for mixing, R. G. Ferguson.... 591,831
Lock, Z. U. Trotman.... 591,901

(Continued on page 286)


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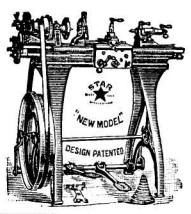

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**9 and 11-inch Swing.**
New and Original Features
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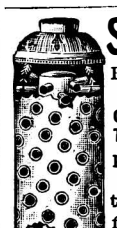

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With its 120 Cross Tubes,
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TO INTRODUCE OUR RADIATOR, the first order from each neighborhood filled at WHOLESALE price, and secures an agency. Write at once.
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*Has these Great Advantages:*
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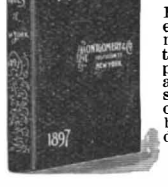


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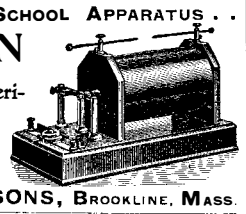

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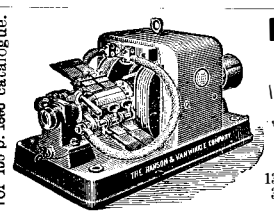

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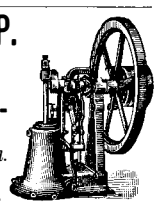

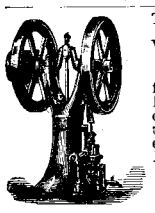

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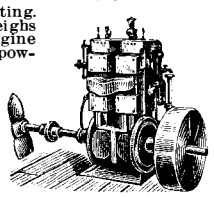

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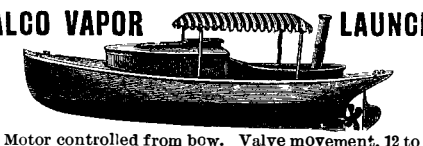
*(Continued on page 287)*


ALCO VAPOR LAUNCH



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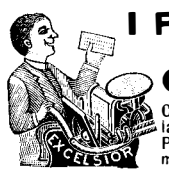

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**What you are to do** is to supply letters of the alphabet in the places of stars in the list of words given below, so as to make words that are adapted to the description given at the right of each set of missing letters. You are to make as many words as you can to fit the definitions, but must only supply as many letters as there are stars. For example we will tell you that the full answer of No. 1 is **PENNSYLVANIA,** because no other letters than **E, N, Y, V, N, A,** can be supplied to make the **name of a State.** Again, in No. 9, for example, you must make all the continuations of letters that will give you the name of a President, and in this instance, just to give you a "tip," we will mention that the 1st two letters in the last name are Mc. **Now can you supply the whole name?**

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| | | | |
|---|---|---|---|
| 1. | P☆N☆S☆L☆A☆I☆ | Name of a State in the United States | |
| 2. | ☆E☆☆E☆☆E☆ | Another State of the United States. | |
| 3. | C☆N☆I☆N☆TI | A place in the United States. | |
| 4. | B☆☆T☆N | Another place in the United States. | |
| 5. | A☆☆☆☆☆A | A well known Country, full of patriotism. | |
| 6. | ☆☆☆☆ON | A large river in America. | |
| 7. | C☆☆☆AG☆ | A place thousands of Illinois people call their home. | |
| 8. | ☆☆☆☆☆SW☆R☆D | A popular monthly publication issued in N.Y. City. | |
| 9. | ☆I☆☆☆☆☆ ☆☆☆☆☆☆☆Y | The name of a man noted for receiving $50,000 a year salary. | |
| 10. | L☆N☆☆L☆ | Name of another President. He was assassinated | |
| 11. | J☆P☆N | Name of a distant Country. | |
| 12. | CHI☆☆ | Name of another distant Country. | |
| 13. | W☆☆☆I☆GT☆N | A noted army general of about a century ago. | |
| 14. | C☆F☆EE | A popular kind of drink. | |
| 15. | ☆A☆ER | Another popular drink. | |

Every word needed to make the list complete has been printed millions of times in Geographies, Dictionaries, Newspapers and other accessible mediums of information. When you have made as large a list as you can, send us your list, with 25 cents to pay for three months' subscription to **Woman's World.** As soon as your letter is received, we shall turn the same over to the well-informed committee of examiners, and, if you have sent at least ten correct words, we shall send you by express, prepaid, our **$50.00 Guarantee American-made Watch** and Chain, with the understanding that, if you find as represented, you are to become a regular subscriber to **Woman's World,** in accordance with our arrangements and offer as indicated in our letter of award to you when you have won the valuable $50.00 Guarantee Watch and Chain. Furthermore, if the committee decides that you have sent a full correct list, you shall receive **$300.00 in money,** also the $50.00 Watch and Chain. When you send your list of words, don't fail to name your nearest express office, as well as post-office address, so the **prize may reach you promptly. Don't forget to mention whether you want a lady's or gentleman's watch.**

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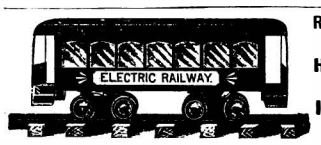


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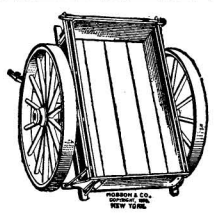


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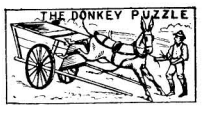


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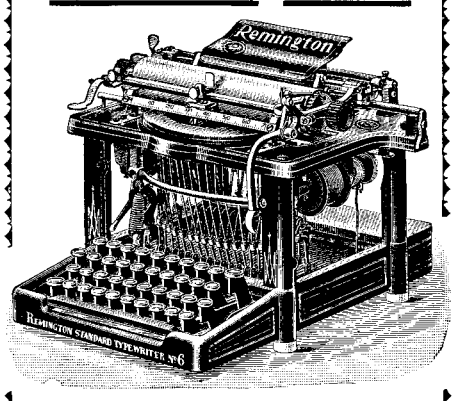


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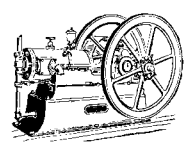

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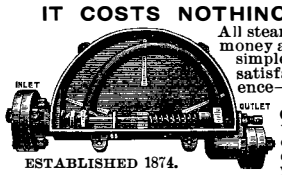


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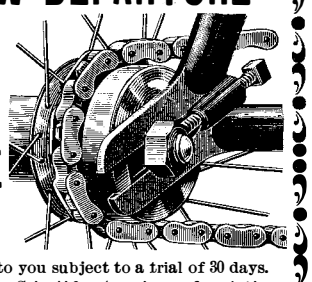

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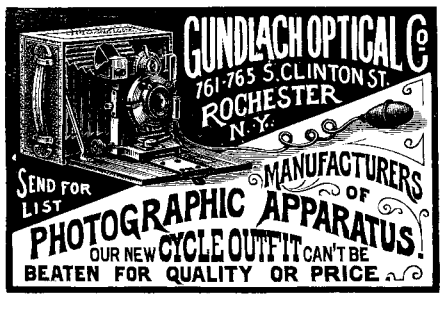


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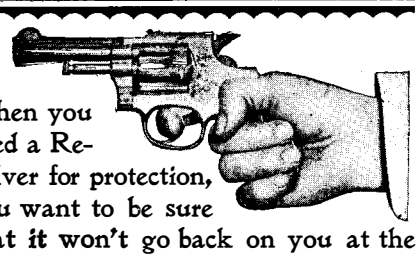

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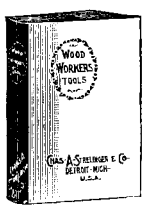


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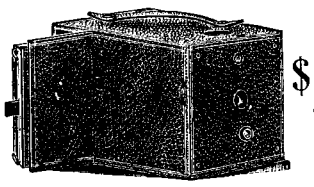

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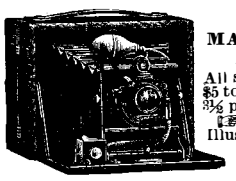

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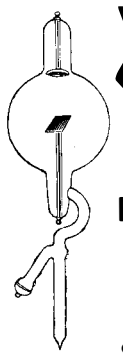

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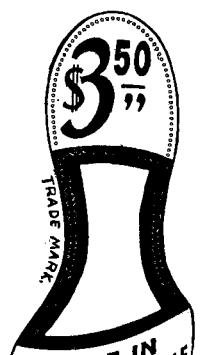


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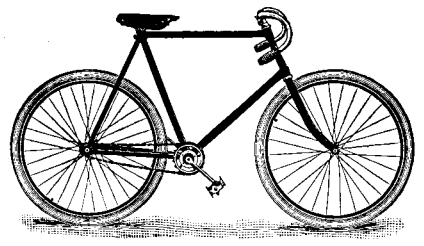

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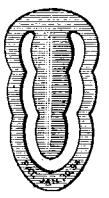

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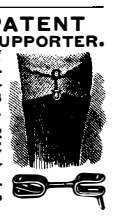

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